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# Electrical World

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# Electrical World

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# *To Analyze Distribution*

FACTS are needed if we are ever to find out definitely what is the matter with our system of distributing electrical goods. We are constantly hearing that something is wrong. But there is very little true knowledge.

It is clear, however, that before much progress can be made toward an improvement in the situation, curative and constructive measures must be undertaken. Present methods, costs and purposes must be studied and compared as they apply to different electrical commodities. And these facts must be known broadly before any common principles can be established and any general understanding of the subject can be hoped for.

SUCH an analysis will not crystallize out of thin air. It will mean work. It will cost money. It will need the experience of long contact and practical familiarity with every phase of our distribution on the part of the investigator. Which is very much the same as saying that each branch of the electrical industry must accept responsibility and undertake its own share of the job of working out the common problem.

The question is: What can the jobber do individually? What can the manufacturer do individually? What can the contractor and dealer do individually? What can the industrial plant do individually? What can these five groups do co-operatively through their associations? What can the Society for Electrical Development do? What can the electrical press contribute?

Perhaps it might be best to organize a "Joint Commission on Electrical Distribution," to initiate a comprehensive inquiry. If so, it should be officially representative of the major associations of these five groups concerned. It should have but this single purpose—to survey, study and report. It should be made up of men carefully chosen, adequately compensated and provided with competent legal guidance.

Out of such an inquiry would come a wealth of facts, from which it should be possible to fabricate a comprehensive picture of electrical distribution as it exists today and as it has operated in the past. In it each man's function, influence and responsibility should stand out clearly.

THE appointment of such a joint commission is not to be lightly undertaken, however. We have already far too many organizations in the electrical industry, and such a purpose might well fall within the scope of the Society for Electrical Development. But if the society plays the full part that it should in the campaign to "electrify America," it will have its hands full for some time. Meanwhile the problem waits.

The Electrical Supply Jobbers' Association has taken a first step in its study of jobbers' costs. What next—and who should do it? We must have facts—not only as to the cost of distribution, but also on the goodness and the badness of our habits.

# Anson Wood Burchard

*A promoter and organizer with an international reputation in the electrical industry.*

IN THE president and chairman of the board of directors of the International General Electric Company and the vice-chairman of the board of directors of the General Electric Company one expects to find a man of a superior degree of executive ability and possessing a broad administrative vision cultivated by extensive experience. Anson Wood Burchard, who was recently elevated to these positions in the councils of the General Electric Company, fulfills in a peculiarly successful manner these requirements. It is men of his type who have made possible the progressive and economical development of the electrical industry by a broad policy of production, distribution and finance which has never permitted the industry to lag on account of internal weaknesses.

With other men who are influential in engineering and financial circles, Mr. Burchard has been a leader in formulating policies for developing the financial resources and credit of public utilities, enabling them to enlarge their buying power and expanding the importance of the central station. In the period from 1900 to 1905 and after he was very active in the consolidation of the several manufacturing units of the General Electric Company. The Stanley Electric Company, the Fort Wayne Electric Company, the General Incandescent Arc Light Company, the Northern Electric Company and the Sprague Electric Company were among the units consolidated under the management of the General Electric. Of late years he has contributed greatly to the development of manufacturing facilities, financial resources and sales methods of foreign manufacturing and sales agencies in such a way as to stimulate the expansion of the electrical industry abroad.

Mr. Burchard is a native of Hoosick Falls, N. Y., and was born April 21, 1865. Completing his studies at the local high schools, he matriculated into that favorite Alma Mater of engineering science, the Stevens Institute of Technology. The institution, of which he is now a trustee, graduated him in 1885 with the degree of mechanical engineer. Under this designation and in the same year he became connected with the J. M. Ives Company, engaged in steam and general factory engineering at Danbury, Conn. The transition from a technical to an executive position followed in 1891, when he became treasurer and manager of the T. & B. Tool Company of Danbury, continuing there almost to the end of the century. At this point his chief interest was temporarily diverted to the mining of copper. From 1900 to 1902 he was vice-president of the Cananea Consolidated Copper Company, operating mines at Cananea, province of Sonora, Mexico. Mr. Burchard, however, soon returned to the destined channel of his labor, which has widened greatly since the year 1902, when he joined the organization of the General Electric Company. Until 1904 he was comptroller at the company's headquarters in Schenectady, at which early date he became assistant to the president.

Mr. Burchard's counsel is sought by numerous interests outside the immediate sphere of his activity, particularly in the field of electric power development. Besides being a director of the General Electric Company, he is on the boards of the American Power & Light Company, the American Gas & Electric Company, the Worthington Pump & Machinery Corporation, the Western Power Corporation, the Central States Electric Company, the Republic Railway & Light Company, the Adirondack Power & Light Company and the Electrical Utilities Corporation. He was influential in the engineering and financial development of the Great Western Power Company. Nor are his electrical affiliations all strictly of a business kind. He is a member of the A. S. M. E., the A. I. E. E., the A. S. C. E. and Iron and Steel Institute of Great Britain. Catholicity of taste in recreation accounts for his membership in many clubs.

# Editorial Comment

Electrical World, July 22, 1922

Volume 80 Number 4

### The Rejection of Ford's Muscle Shoals Offer

THE Senate of the United States is a deliberate body not easily swayed or cajoled by claptrap oratory or flamboyant propaganda. For that reason it was expected that its agricultural committee would penetrate the mass of jingoism and fanaticism surrounding the bid of Henry Ford for Muscle Shoals and reject his trumpeted offer. That Senator Norris' committee has done with admirable grace. Nor could it very well have done otherwise. Had any one else made an offer like Ford's, neither the Senate nor the House of Representatives would have wasted a year considering it. Congress would have rejected it forthwith. The terms and conditions laid down by Ford were never fair or just to the taxpayers. They were opposed to the fixed policy of the government, and so flagrant was the effrontery that all the red herrings of fiat money. hundred-mile cities, cheap fertilizer, revitalized South, etc., were never strong enough to throw thoughtful men off the trail.

The Ford offer will now come before the full Senate, where it is certain to meet the doom that is its due. We believe that, in the best interests of the South and of the country as a whole, the Tennessee River at Muscle Shoals should be developed by a public utility company. Unfortunately, the Ford propaganda has been effective enough to make such a disposition of the project to the particular public utility which logic would indicate out of the question at this time. Eventually the public of the South, particularly of Alabama, will get a proper perspective of the Muscle Shoals controversy and wonder why it was so short-sighted as not to see the advantages which would accrue through public utility operation. We have every reason to suppose that even were the government to complete the project it would lease the water power to a public utility corporation and that it would feel, in so doing, that it was acting for the best interests of Southerners as well as the taxpayers in the country as a whole.

### Protective Value of Choke Coils Is Questionable

CONSIDERABLE discussion has arisen lately regarding the value of using series inductance (choke coils) or shunted capacity to protect transmission lines and attached equipment against lightning disturbances. Either device will cause a reflected wave, and sustained oscillations may be set up in relation with the line constants. In this case the original strain may be increased and the time of application prolonged. This danger may be minimized by providing resistance in which the original energy starting the oscillations may be dissipated in successive cycles; consequently the suggestion has often been made that protective choke coils be shunted with a relatively high resistance. In the case of the condenser the resistance is placed in series with the condenser, the combination being shunted between line and ground. The addition of this resistance to the choke coil has rarely been adopted, probably because of uncertainty as to its value. In fact, the whole question as to whether this type of auxiliary apparatus should be installed at all is now the subject of considerable discussion. This is doubtless because of the wide variation of the type of the disturbing lightning impulse and the fact that the choke coil has a frequency limit below which it offers little protection. The shunted condenser has not been regarded with favor in this country owing to the lower cost and greater practicability of the choke coil. Moreover, the apparatus to be protected usually has itself a higher protective value than any permissible choke coil because of its inherent reactance. The suggestion is now frequently heard that an equivalent, if not greater, measure of protection may be had by putting the cost of the choke coil into increased insulation of the line terminals of the equipment. This tendency away from the use of choke coils, already noticed in this country, has been given the emphasis of open expression in Europe, at the international conference on high-tension transmission held in Paris several months ago.

### Dangerous Lure of Statistics

WE HAVE been greatly entertained of late by the revival of the public ownership debate, with the Hydro-Electric Power Commission of Ontario, W. S. Murray et al. as active participants. The end is not reached and the single taxers and fundamentalists have yet to be heard from. The striking part of the discussion is not its novelty but the fact that both sides draw their bows (it would be impolite to say long bows) with arrows from the same quiver. As we have often reiterated, one cannot safely draw conclusions from one generating plant for another unless guided by practical omniscience; the facts in this case emphasize this view.

It seems indeed remarkable that simple things like the costs to the consumer cannot be so stated as to be definite, but to the mind of a confirmed statistician all things in the way of averages are horrible. For example, what is the average price of electrical energy from the consumer's standpoint? One answer is given by reckoning from the total output and the total receipts therefor, quite another by averaging the rates paid by the individual consumers. And the fact that John Doe is paying 1 cent per unit is no consolation to Richard Roe, who is paying 10.

Only when everybody pays the same rate per unit does the problem become definite, and this is a condition notoriously undesirable from the viewpoint of costs of service, which, however much publicists may grumble, somebody must pay. And is it fair to shovel Roe's costs upon Doe? After matters like this are fairly threshed out, one can profitably take up distribution of depreciation, whether bonded indebtedness is perpetual or pay-

able, the segregation of charges between public departments and other casual phases of the situation.

The evidence thus far presented shows that the data at hand are an unfailing fountain of irreconcilable conclusions. Nobody but the men who compile statistics on a large scale knows exactly what is implied, and even they may have forgotten. From the whole matter, however, we are inclined to draw three theses that may be generally defended:

First: That the clash of statistical data is the meeting of an immovable body and an irresistible force.

Second: That the Hydro-Electric Power Commission within its necessary limitations has done an unusually effective job.

Third: That any honest person who, knowing the political history of New York, Chicago, Boston, Philadelphia et al., desires to see public ownership of electric utilities undertaken by them should be sent to the psychopathic ward for observation.

## Stifling Generator Fires with Inert Gas Has Advantages

THE very complete experiments of the Union Electric Light & Power Company at St. Louis to determine the effectiveness of using carbon-dioxide gas for extinguishing generator fires (reported elsewhere in this issue) open up a new method of fighting electrical fires which seems to have marked advantages over other methods proposed. Steam and water as fire extinguishers have the disadvantage that systems which can be operated promptly are difficult to install without incurring the danger of introducing moisture at the wrong time. Besides, the moisture will permeate the windings, which must be carefully dried out before being restored to service. Even then, there is a question of whether breakdown may not occur as a result of the wetting.

The system in use in St. Louis has none of these disadvantages. According to the tests, it required a little more than 15 per cent of $CO_2$ to smother a fire. To produce this concentration in a 20,000-kw. generator in a short enough time to be effective in preventing extensive damage involved some difficulties at first. However, they were overcome, and the required saturation was obtained in one and one-quarter minutes.

This use of a closed-circuit ventilating system into which an inert gas can be injected when a fire is detected is a step in the right direction and seems worthy of more extensive application.

## Farm Interests Taking Hand in Rural Lines Question

IT SEEMS that some utility executives are not yet awake to the meaning of the demand for electric service on the farm. In a discussion of the subject a short time ago one man declared that his company had investigated its rural lines and as a result had decided to get rid of them as soon as possible. In conversation he took the position that it was up to the farmer to get the service and that the utilities should assume no responsibility. This certainly does not represent the attitude of the electric light and power industry. Utility commissions have taken cognizance of the demand for farm service, and a considerable amount of progress has been made in developing methods of establishing the service. In this work the electric light and power industry has co-operated. The feeling exists that the central station must assume some responsibility for farm service, whether it wishes to do so or not.

In deciding policies on this subject it will be well to bear in mind that there are some strong organizations in the country representing the farmer and his interests. In fact, in one or two cases some of these agencies have already been pulled into the question. The most notable case is the one recently before the Illinois Commerce Commission in which the Farm Bureau was formally represented and took an active part. It is unfortunate that in this particular case serious misunderstanding of the conditions involved in farm service prevailed, and it is more unfortunate in view of the fact that much of the misunderstanding seemed traceable to the prevalence among a very few central-station men of an attitude like that noted above. This attitude seems to have been a real factor in the creation of a condition that led the commission to rescind the existing rules covering the establishment of rural service and open up the whole question on a more or less controversial basis. Fortunately, broader-visioned central-station men have taken hold in this case and an effort to work out the solution in a co-operative way has been begun.

One way in which the situation can be worked out in a satisfactory manner is to get all interests together for a friendly study of the problem. "Buck passing" in the effort to avoid responsibility may end in thrusting the whole question of rural service on the farm into the political arena. It is too close to that status for comfort right now in some localities, and the question is no longer one that can be confined to utility circles. Others are already taking a hand.

## Prompt Service and Accurate Accounting Essential to Storeroom Operation

THAT materials in the storeroom should be handled as carefully as cash is a statement that has been made so often that it may sound trite. Unfortunately, practice has not measured up to the theory among many central stations and untidy, slipshod storerooms are all too prevalent. In addition to careful buying and accounting for supplies there is a third essential in good storeroom practice that is almost entirely overlooked, or else allowed to dominate the stores force to the exclusion of all else. This essential is prompt service in providing the supplies needed and in getting requisitions filled with the least possible loss of time. In one case the stores system is built on the theory that securing of material must be made as difficult as possible to impress the working forces with the value of the articles they use. The result is a stores department that hampers all company operations and is continually at odds with other departments. The other extreme exists where getting material out promptly is insisted on to an extent that prevents proper accounting. In such cases the working forces are allowed to grab material and let the stores force account for it as best it can.

There is a happy medium in which the stores system is built up with an eye to both proper accounting and system service. Both objects require careful co-operation between the various departments and the storekeeper. The function of the latter is the provision of such working materials as the executive officers decide

are necessary for the welfare of the property. He also has the duty of seeing that all material passing through his hands is fully accounted for as to issuance from the storeroom on proper authority and charged to the correct accounts. Beyond this the responsibility becomes one belonging to the department heads.

An excellent example of how the problem can be worked out was presented by Paul Hoheisel in the July 15 issue, where he referred to the system used by the Oklahoma Gas & Electric Company. The record system which he outlined is not particularly new, but a study of the manner in which the details have been handled to enable service along with proper accounting should be beneficial to every one. The method of arranging stock to save time in issuing material is a rather valuable feature that can be copied with profit. One of the serious faults of many storerooms is that the stock is arranged so haphazardly that the storekeepers never know just what they have. This problem has been given a careful study by the Oklahoma company. The solution has been found not only in a careful arrangement of storage facilities but also in a thorough tying together of the actual stock and the records on the ledgers. The use of materials on hand (by substitution) until frozen stocks have been used up is an important practice in which the storekeeper must play a prominent part. Most important of all is the standardization of materials used in the most common operating and construction activities. This is one of the most potent factors in the elimination of frozen stocks, which are usually due to lack of judgment in purchasing or to allowing department heads to follow their own fancies in the use of materials without any effort to co-ordinate those fancies.

## A Correction as to Fact, but Not as to Opinion

IN THE June 17, 1922, issue of the *Electrical World*, on page 1207, an editorial under the title "Over-regulation of Radio Installations Undesirable" was in error in stating that an ordinance establishing control of radio installations in the city of Chicago had been passed. A news item on page 1240 of the same issue gives the true status of the measure, which is that of an ordinance introduced and on which hearings will be held to give those interested an opportunity to present their views.

The intent of the original editorial as a protest against over-regulation is, however, again called to attention. The underwriters have proposed certain changes in the insurance rules that are simple, cost little and will make for improvement in the installation of radio sets. There have been some regrettable accidents due to ignorance or carelessness in the installation of radio apparatus, notably in the putting up of antennas. However, the ordinary receiving set is in no way connected with the house-lighting system. The installations involving house wiring, conflicts with light and power conductors and any situation in which danger is created by reason of the proximity of conductors carrying high potential are undoubtedly covered under existing ordinances in any city exercising control over electrical installations, unless there are defects in the ordinances. Until there are developments in the radio field that indicate the need of elaborate supervision and inspection systems the reasonable course would seem to be the use of existing facilities and ordinances with such corrections of defects as are found necessary.

## Compensation of Current Transformers a Distinct Advance

NOT the least important characteristics of electrical apparatus in general, as bearing on its reliability, efficiency and satisfactory performance, are the variety and simplicity of available principles of compensation and the facility with which they may be applied. Voltage drop in direct-current generators is corrected by the series field winding. The same auxiliary serves to adapt the motor to the special speed and torque requirements of its load, and in the synchronous converter to give proper adjustment of power factor. The compensating pole, the induction regulator and various modifications of differential windings are but a few of the numerous instances in which compensation for inherent limitations is accomplished by the simple addition of an extra coil or two, or at most an auxiliary pole or transformer.

A new application of this general principle was announced in the recent paper of Brooks and Holtz before the annual convention of the A. I. E. E. on the current transformer, an instrument which is subject to well-known inaccuracies in the matters of ratio and phase angle. The transformer is inherently one of the most perfect types of electrical equipment as regards voltage regulation and ratio, but at light loads the current ratio and the phase difference of primary and secondary currents suffer wide variations, due to the superposed magnetizing current in the primary circuit. This fact, of little consequence in power transformers, assumes great importance in the current transformer when connected to wattmeters for measuring the power of the primary circuit. The Brooks transformer aims to correct these errors, and its principle is so simple as to excite surprise that it has not been adopted before.

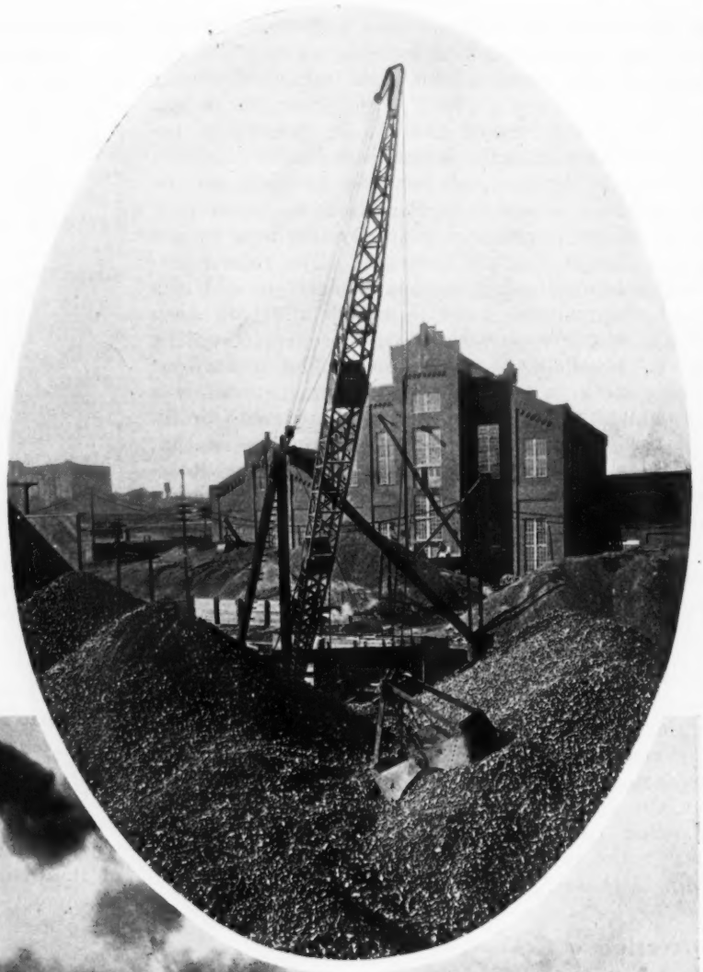
Recognizing that two currents may be combined vectorially by passing both around the same magnetic circuit, primary and secondary currents of the usual current transformer are carried through two windings on a branch magnetic circuit, and a tertiary winding on this circuit receives an electromotive force due to flux set up by the resultant of primary and secondary currents. As it is this resultant, with its varying value and phase, that causes the principal errors, the tertiary circuit carried to a separate winding on the wattmeter affords a large measure of compensation, as evidenced by greatly improved ratio and phase-angle curves.

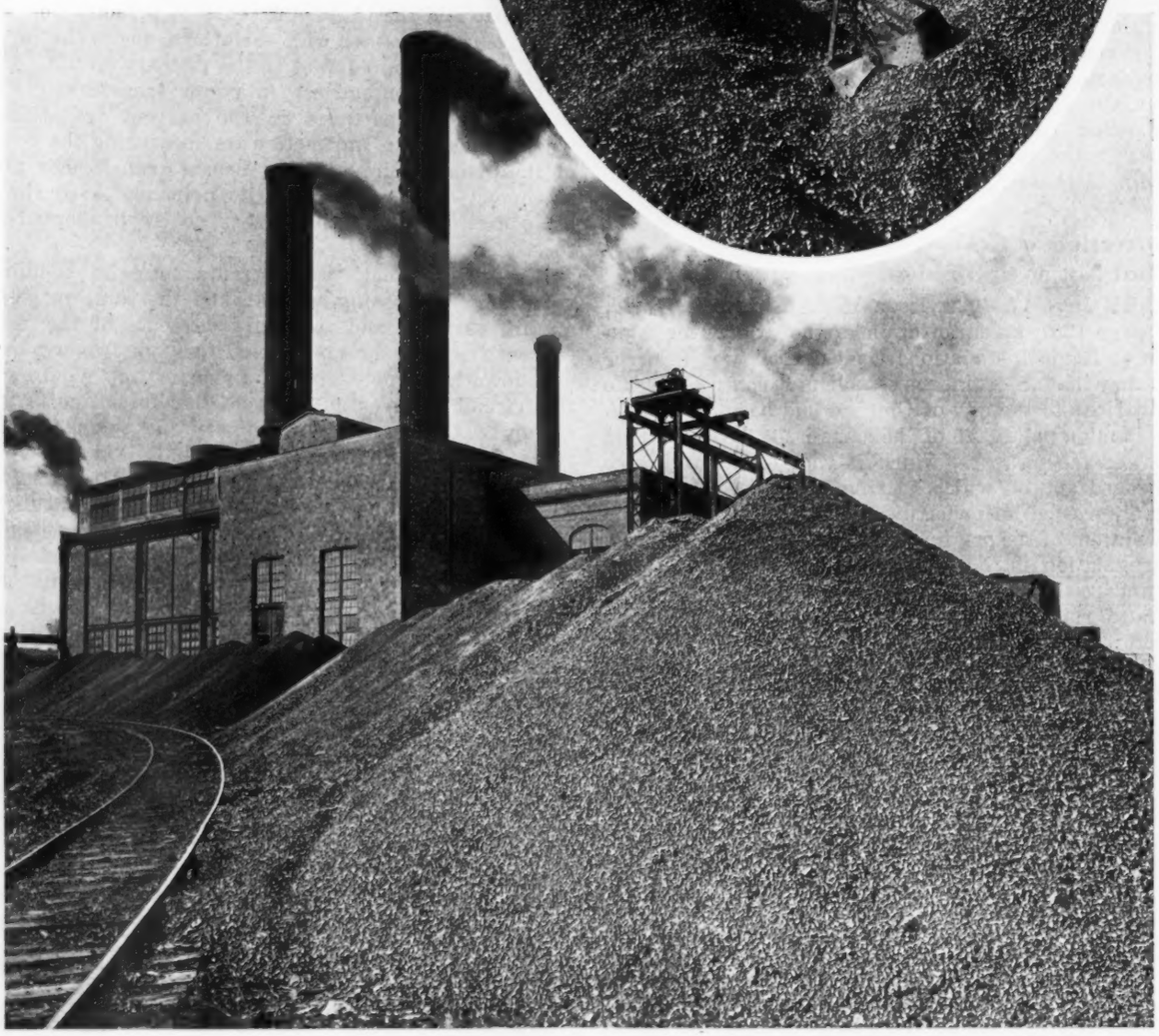
Naturally the compensation so afforded is not obtained without certain disadvantages. The weight and cost of the transformer are increased, and an additional winding is required on the wattmeter. Further, in the case of high-voltage primary circuits especially, there are certain types of error, arising in secondary leakage reactance, which are not completely compensated by this method. In many commercial designs secondary leakage reactance is frequently comparable in magnitude to the rated secondary burden, and if not inherently balanced in the primary both ratio and phase relation between primary and secondary may be upset. However, the added weight and cost are relatively unimportant as compared with the increase in accuracy obtained, and the reactance errors are negligible in many cases and can probably be reduced by careful design in others.

The new transformer appears to be a distinct advance in the problem of metering large power systems.

# A Monument to Electric Service

Anticipating a coal strike, the Nebraska Power Company of Omaha, like every other wide-awake public utility company, took the precaution to store up a bountiful supply of fuel. Because of this 33,500 tons in storage patrons in Omaha are enjoying electric service as usual, in spite of coal and railroad strikes.





# Extinguishing Generator Fires with $CO_2$

## Arrangement of the Fire-Extinguishing Equipment at the Ashley Street Plant of the Union Electric Light & Power Company—Percentage of Gas Necessary to Be Effective Shown

By J. B. WHEELER
*Assistant Chief Engineer Union Electric Light & Power Company, St. Louis*

WITH the advent of turbo-generators of increased capacity we are confronted with many problems, among which the protection of generators against fire is a vital one. Particular importance attaches to this task by reason of the monetary loss involved in the destruction of these large types of equipment as well as the reduction in capacity caused by the loss of a single unit. The excessive volumes of air required for ventilation impose added tasks in the prevention as well as control of these fires.

It is common practice in the construction of the larger types of turbo-generators for the ventilating fan to be made integral with the generator rotor, requiring the air supply to be under suction at all times. This permits foreign material to enter through crevices and other places despite the protective screens. Even though the suction chambers are isolated and provided with screens and air washers, a certain amount of foreign matter, oil, etc., is brought into the generator. This dirt accumulates in the generator windings, particularly the end turns, and, with high temperatures caused by electrical troubles within the unit, by the distribution system or by static electricity within the machine, provides fuel for rapid combustion when once ignited.

### ARRANGEMENT OF EQUIPMENT

The larger types of units require air capacities of 55,000 cu.ft. per minute and upward, this figure representing the volume required for a 20,000-kw. General Electric unit. The weight of air passing through one of these machines per hour is approximately equal to the weight of the unit itself. Under these conditions the need of fire protective devices is apparent, and many systems and methods have been developed for this purpose. Water and steam have been used for some time and have proved quite efficient. At the Ashley Street station of the Union Electric Light & Power Company are installed three 20,000-kw. units, one 10,000-kw. horizontal unit and one 4,000-kw. horizontal unit. About a year ago experiments were undertaken to determine the practicability of carbon dioxide ($CO_2$) gas for extinguishing such fires. The excessive volume of air supplied for ventilation proved the greatest obstacle to this method, and it was only after extensive experiments that a successful installation was completed. A typical arrangement of the installation is shown in Fig. 1, the principal features of which are two. First, a set of dampers is so situated in the discharge duct that when closed they completely block off the discharge, leaving an opening from the discharge duct to the suction and thereby short-circuiting the discharge back into the suction. Having no outlet, no additional air is brought in, and with the exception of a small leakage, this constant quantity of air is revolved in the generator and suction chamber. Second, after the dampers are closed sufficient carbon dioxide gas is injected into the suction chamber from a common storage tank to extinguish the fire, the quantity of $CO_2$ being based on experiments described later in this article.

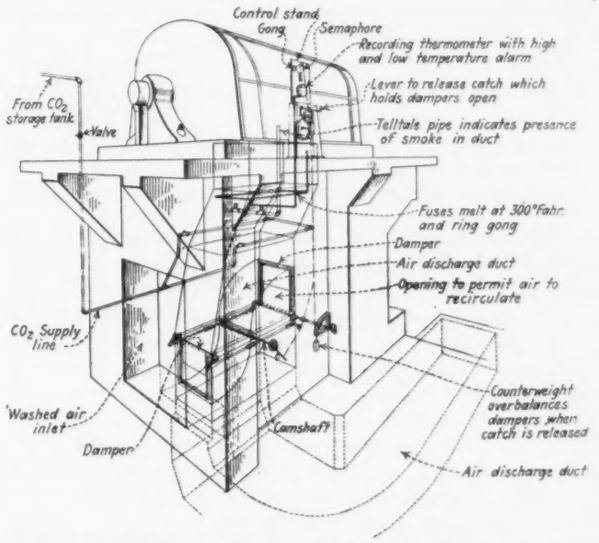



FIG. 1—TYPICAL ARRANGEMENT OF VENTILATING DUCTS, FIRE INDICATING AND CONTROL APPARATUS

Washed air for generator ventilation enters through opening in left foreground, passes up through suction chamber which surrounds the discharge duct, and after circulating through generator passes down through discharge duct to discharge tunnel in right foreground. There being a constant pressure in the air chamber, the presence of fire will be evidenced by smoke issuing from the telltale pipe at left of control stand. High temperature will also be indicated by the recording thermometer, which operates an alarm bell. Attached to this alarm are also fusible links set to fuse at 300 deg. and thereby operate the alarm. After assurance that a fire exists, the damper-closing lever on control stand is operated, allowing counterweight to drop and close dampers in discharge duct. Their position is indicated by a semaphore. The operation of the dampers also uncovers an opening between discharge duct and suction duct, permitting recirculation of cooling air. Immediately upon closure of dampers, the cam shaft operates to wedge the doors against supporting angles and thereby prevent air leakage. $CO_2$ gas is then admitted to the closed ventilating circuit to stifle combustion, by operating valve in $CO_2$ supply line.

To determine the saturation of air with $CO_2$ gas that

TABLE I—ACTION OF CANDLE FLAME WITH VARIOUS PERCENTAGES OF $CO_2$

| Per Cent $CO_2$ | Remarks |
|---|---|
| 21.5 | Flame extinguished immediately on entering neck of bottle. |
| 20.8 | Flame extinguished immediately on entering neck of bottle. |
| 19.4 | Flame extinguished immediately on entering neck of bottle. |
| 17.2 | Dropped about 2 in. farther into bottle before being extinguished. |
| 17.0 | Dropped about 2 in. farther into bottle before being extinguished. |
| 15.6 | Dropped half way to bottom of bottle, diminishing in size gradually until extinguished. |
| 14.0 | Gradually diminished in size and was extinguished about 1 in. from bottom of bottle. |
| 13.8 | Gradually diminished in size and was extinguished just as it reached bottom of bottle. |
| 12.7 | Flame gradually diminished in size, being very small when it reached bottom of bottle, but was maintained and gradually increased as it was raised, burning brightly as it left the bottle. |

would not sustain combustion, observations were made of the action of various percentages of $CO_2$ gas on a tallow-candle flame. The $CO_2$ gas was supplied from a commercial tank 8 in. in diameter and 4 ft. high. The gas was mixed with the air in a 5-gal. glass bottle. A candle fastened to a wire was then lowered into the bottle and the effect on the flame noted. The percentage $CO_2$ gas was measured with an Orsat apparatus,

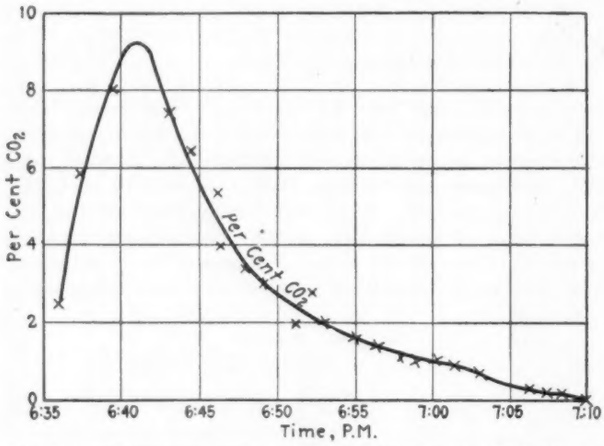



FIG. 2—PRELIMINARY TEST OF TIME REQUIRED TO LIBERATE $CO_2$ AND OBTAIN MAXIMUM PERCENTAGE OF SATURATION OF AIR IN THE GENERATOR VENTILATING DUCTS

samples being drawn through a glass tube from the center of the bottle, the tube being held by a rubber stopper in its mouth. A small hole was put in the stopper to allow a little air to enter while drawing a sample into the Orsat apparatus. Carbon dioxide was liberated into the bottle for a few seconds through a hose. The bottle was then turned bottom side up several times to agitate the mixture of $CO_2$ gas and air. A sample of the mixture was then drawn into the Orsat apparatus and the percentage of $CO_2$ gas determined. The lighted candle was lowered into the bottle to a point where the flame was extinguished and then withdrawn. The bottle was next held with the mouth down for about fifteen seconds to allow some of the $CO_2$ gas to escape. The above performance was repeated and more $CO_2$ allowed to escape until, with decreasing percentage of $CO_2$, the candle burned when lowered to the bottom of the bottle. The results of the experiments are shown in Table I.

The results indicated that, despite the agitation of the mixture, the $CO_2$ gas tends to settle to the bottom. The samples being drawn from the bottle at a point about half way up from the bottom, the percentage of $CO_2$ at which the candle was extinguished at this point is taken as the amount necessary to quench a candle flame, or 15.6 per cent $CO_2$. It is evident, therefore, that sufficient $CO_2$ should be liberated into the generator to form a saturation of not less than 15.6 per cent by volume.

The saturation of $CO_2$ that could be obtained and the length of time which it could be maintained by admitting a known quantity of $CO_2$ into the suction chamber of the generator with the discharge dampers closed was also determined. This was done by liberating two 50-lb. drums of liquid $CO_2$ simultaneously into the suction chamber and measuring the $CO_2$ percentage with two Orsats. The samples were taken as quickly as possible out of the telltale pipe previously described. Considerable difficulty was encountered in the liberation of the liquid $CO_2$ owing to the rapid expansion causing freezing of the pipe lines, particularly at the throat of the drums. By alternately opening and closing the valves most of the $CO_2$ was released. The time required, however, was greater than would have been necessary if the gas had been admitted at lower pressures. A record (Table II) was kept of the actual time each tank was discharging to obtain the relation of time of maximum saturation to maximum input of $CO_2$.

The saturation obtained is plotted in Fig. 2 with relation to time. The maximum $CO_2$ saturation by analysis was 8.9 per cent at 6:41:30, the previous reading being 8.0 per cent at 6:39:40. Both tanks were recorded as being on discharge at 6:42:10, or forty seconds later, and it appears reasonable to assume, owing to difficulties in recording the time accurately at the several locations, that the maximum saturation was obtained when the two tanks were open at the same time. The curve indicates a maximum saturation of 9.2 per cent. The tanks contained approximately 400 cu.ft. each, or 800 cu.ft. of free gas. Assuming 80 per cent liberated, 640 cu.ft. was discharged into the generator. The volume of the suction chamber is approximately 6,000 cu.ft., and with no leakage the saturation would have been 10.6 per cent. The difference between this and the actual results indicate the amount of leakage. It will also be observed from Fig. 2 that a trace of $CO_2$ remained as long as thirty-six minutes, showing the leakage to be quite small. Manometer readings were taken in the suction and discharge tunnels after blowing out the $CO_2$ and reclosing the dampers. No readings could be obtained to indicate any appreciable air flow.

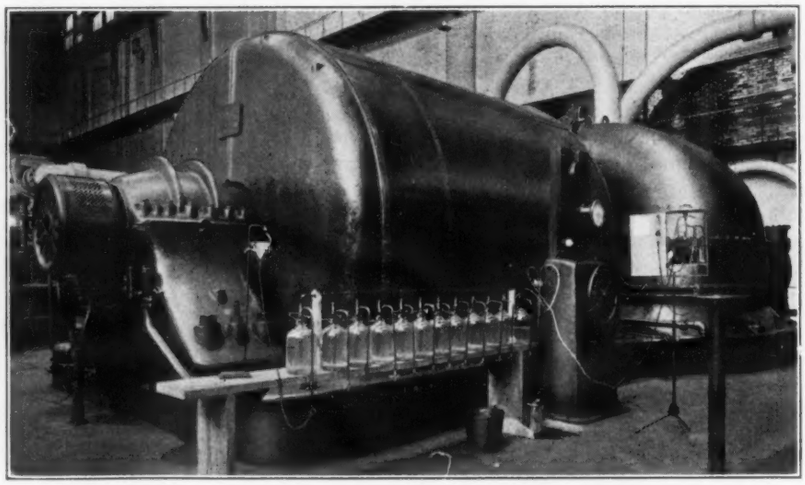


FIG. 3—APPARATUS FOR TAKING SAMPLES OF AIR IN GENERATOR VENTILATING DUCTS ON FINAL TEST OF FIRE-EXTINGUISHING APPARATUS

From the previous experiment it was established that 15.6 per cent saturation will not sustain combustion, and from the above test it was found that with the equipment as set up we could utilize 86 per cent of the $CO_2$ supplied. On this basis it was calculated that a generator with a supply chamber contain-

ing 6,000 cu.ft. would require: $6{,}000 \times \frac{15.6}{100} \div \frac{86}{100}$ = 1,088 cu.ft. $CO_2$.

As it was preferable from the standpoints of both practicability and hazard to supply this gas at a pressure not to exceed 150 lb. (gage) pressure, the above results indicated a required storage capacity of approximately 110 cu.ft. Consequently a storage tank 3 ft. in diameter by 16 ft. long was installed and connected by common header to all machines.

### TEST OF FIRE-EXTINGUISHING EQUIPMENT

To determine the maximum saturation that could be obtained and the length of time over which it could be

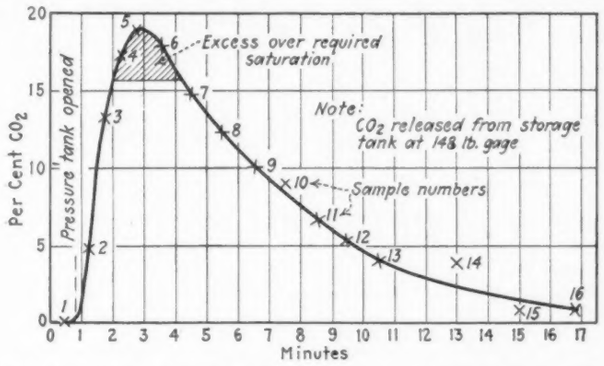



FIG. 4 — THE FINAL ARRANGEMENT OF APPARATUS PERMITTED EMPTYING SUFFICIENT $CO_2$ INTO THE GENERATOR VENTILATING DUCTS TO SMOTHER FIRE

The required saturation of 15.6 per cent was reached in one minute and fifteen seconds, and it was maintained for a period of two minutes and fifteen seconds at this or a greater value.

maintained tests were conducted by releasing a storage tank of 113 cu.ft. capacity through a 2-in. pipe line into generator housing. Because of the quantity of gas released instantaneously considerable care was given to the method that was used of obtaining and analyzing samples.

A series of gallon glass jugs were set up as shown in Fig. 3 and filled with water from the bottom, driving all air out. By siphoning the water out of each jug consecutively a continuous gas sample was obtained. These samples were analyzed with an Orsat immediately after all samples were taken. The saturation obtained and the length of time maintained are shown in Fig. 4, which indicates that the required saturation of 15.6 per cent was available in one minute and fifteen seconds

TABLE II—TIME REQUIRED TO EMPTY $CO_2$ TANKS INTO GENERATOR VENTILATING DUCTS ON PRELIMINARY TESTS

| No. Tanks Discharging | Time | | No. of Minutes |
|---|---|---|---|
| 1 | 6:35:20 | —6:39 | 3¾ |
| 1 | 6:39 | —6:42:10 | 3⅛ |
| 2 | 6:42:10 | —6:44 | 1⅞ = 3¾ |
| 1 | 6:44 | —6:44:30 | ½ |
| 1 | 6:50 | —6:51 | 1 |
| 1 | 6:54 | —6:57 | 3 |
| 1 | 7:00 | —7:00:30 | ½ |
| 1 | 7:02 | —7:03 | 1 |
| Total time to empty tanks | | | 16½ |

NOTE—During previous test six and one-half minutes was required to empty three-quarters of a tank, or approximately 300 cu.ft.

and was maintained for a period of two minutes and fifteen seconds. A trace of $CO_2$ was maintained over a total period of seventeen minutes, indicating very little leakage in the generator housing or dampers. Manometer readings were taken just after dampers were closed and before $CO_2$ was admitted. No air flow was recorded.

## Water Power in North Carolina

A RAPID metamorphosis has occurred in North Carolina in the past decade by which the state has moved from twenty-third to about tenth in value of its industries and from nineteenth to about fourth place in value of crops, as well as becoming the greatest industrial state in the South. Accompanying this has come a tremendous demand for power to meet the needs of the growing industries. This has been met in large part by the creation of a gigantic water-power development. Nowhere east of the Rocky Mountains is so large a proportion of the total power for industrial use supplied by hydro-electric development. Even so, there is a dearth of power in the state today, and the hydro-electric industry is bound to be greatly extended within the next decade.

To discover the present distribution and concentration of power development in North Carolina and the exact situation as to power output and power needs, the State Geological Survey, under the direction of Thorndike Saville, hydraulic engineer, and in co-operation with the United States Geological Survey, is now conducting a power census covering the following subjects: Total amount of power used, whether water power, steam or oil; type of installation; number of wheels; height of dam; use of power; method of using power, that is, whether machinery is directly connected, belt-driven or served by individual motors; whether power is purchased, and if so, from what source, and whether more power is needed and, if so, whether it can be purchased. Very comprehensive data are being obtained as to the power situation in the state. When the census is completed the shortage of power and the location of markets for new power will be definitely known. The survey will then be in a position to investigate immediately the water-power resources of those districts where the power shortage is most acute and advise to what extent new water power can be advantageously developed. If sufficient water power cannot be economically developed,

| Operating Company | Total Horsepower |
|---|---|
| Bridgewater plant, Southern Power Company | 30,000 |
| Lookout Shoals, Southern Power Company | 33,000 |
| Blewitt Falls plant, Carolina Power & Light Company | 32,150 |
| Buckhorn Falls plant, Carolina Power & Light Company | 3,350 |
| Badin plant, Aluminum Company of America | 93,000 |
| Narrows of Yadkin plant, Aluminum Company of America | 20,000 |
| Cheoah plant, Aluminum Company of America | 72,000 |
| Tuxedo plant, Blue Ridge Power Company | 8,000 |
| Ivy, Marshall and Weaver plants, North Carolina Power Company | 7,750 |
| Other public utility plants less than 5,000 hp. | 14,292 |
| Manufacturing plants, census of 1914 | 41,181 |
| Estimated manufacturing development since 1914 | 5,277 |
| Total | 360,000 |

other methods will be outlined for supplying power needs.

Until this census is completed exact figures as to water-power development in North Carolina are not available. From the best data at hand the present water-power development is approximately as given in the accompanying table.

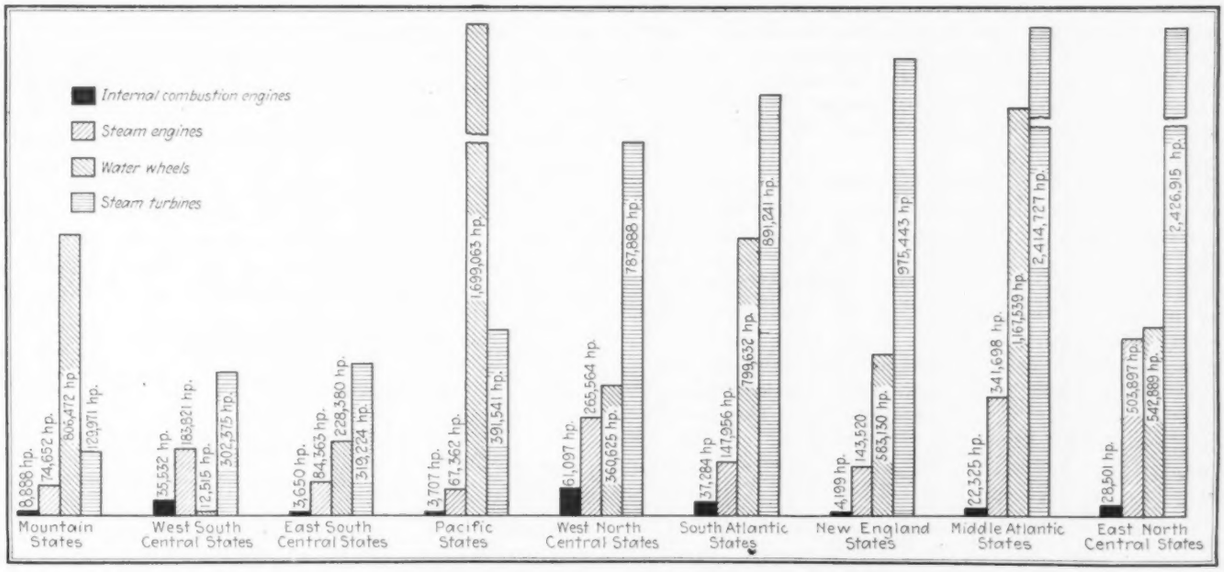
Of the total of 360,000 hp., 80,000 hp., or 22 per cent, is transmitted for use outside the state, and 113,000 at Badin, or 31 per cent, is used in the local reduction of aluminum. The remaining 167,000 hp. available for general, industrial and public use amounts to only 46 per cent of the total developed in the state. Of this approximately 45,000 hp. is developed and used for private manufacturing establishments in relatively small units.

# Generator and Prime-Mover Equipment of the Central Stations of the United States as of Oct. 1, 1921

| States and Sections | Number of Operating Companies | Number of Generating Plants | Rating of Installed Generators, Kw. | Prime Movers | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Steam Engines | | Steam Turbines | | Internal Combustion Engines | | Waterwheels | | Boilers | |
| | | | | Hp. | Per Cent of Country | Kw. | Per Cent of Country | Hp. | Per Cent of Country | Hp. | Per Cent of Country | Hp. | Per Cent of Country |
| United States | 5,624 | 5,532 | 14,466,915 | 1,812,833 | 100.0 | 8,639,325 | 100.0 | 205,183 | 100.0 | 6,200,245 | 100.0 | 4,042,922 | 100.0 |
| SECTIONS | | | | | | | | | | | | | |
| New England | 350 | 341 | 1,343,542 | 143,520 | 7.9 | 975,443 | 11.3 | 4,199 | 2.0 | 583,130 | 9.4 | 308,421 | 7.6 |
| Middle Atlantic | 592 | 575 | 3,257,974 | 341,698 | 18.9 | 2,414,727 | 27.9 | 22,325 | 10.9 | 1,167,539 | 18.9 | 967,236 | 23.9 |
| South Atlantic | 659 | 633 | 1,777,373 | 147,956 | 8.1 | 891,241 | 10.3 | 37,284 | 18.2 | 799,632 | 12.9 | 386,149 | 9.6 |
| East North Central | 1,174 | 1,095 | 3,548,763 | 503,897 | 27.9 | 2,426,915 | 28.2 | 28,501 | 13.9 | 542,889 | 8.6 | 1,139,742 | 28.2 |
| West North Central | 1,419 | 1,286 | 1,313,292 | 265,564 | 14.7 | 787,888 | 9.1 | 61,097 | 29.8 | 360,625 | 5.8 | 499,399 | 12.4 |
| East South Central | 358 | 368 | 517,569 | 84,363 | 4.6 | 319,224 | 3.7 | 3,650 | 1.8 | 228,380 | 3.7 | 198,866 | 4.9 |
| West South Central | 545 | 572 | 485,063 | 183,821 | 10.1 | 302,375 | 3.5 | 35,532 | 17.3 | 12,515 | 0.2 | 246,119 | 6.1 |
| Mountain | 300 | 365 | 683,930 | 74,652 | 4.1 | 129,971 | 1.5 | 8,888 | 4.3 | 806,472 | 13.0 | 125,295 | 3.1 |
| Pacific | 227 | 297 | 1,539,409 | 67,362 | 3.7 | 391,541 | 4.5 | 3,707 | 1.8 | 1,699,063 | 27.5 | 171,695 | 4.2 |
| NEW ENGLAND: | | | | | | | | | | | | | |
| Maine | 75 | 82 | 116,281 | 14,868 | 0.8 | 17,950 | 0.2 | 250 | 0.1 | 156,549 | 2.6 | 15,425 | 0.4 |
| New Hampshire | 49 | 56 | 52,157 | 23,085 | 1.3 | 17,075 | 0.2 | 1,110 | 0.5 | 112,865 | 1.8 | 26,642 | 0.7 |
| Vermont | 56 | 72 | 87,619 | 7,995 | 0.4 | 9,450 | 0.1 | 9 | 0.0 | 72,651 | 1.2 | 11,682 | 0.3 |
| Massachusetts | 119 | 82 | 739,917 | 67,522 | 3.8 | 635,226 | 7.4 | 580 | 0.2 | 157,605 | 2.5 | 160,790 | 3.9 |
| Rhode Island | 12 | 6 | 143,283 | 5,980 | 0.3 | 124,370 | 1.4 | 1,125 | 0.6 | 3,510 | 0.0 | 24,362 | 0.6 |
| Connecticut | 39 | 43 | 204,285 | 24,070 | 1.3 | 177,372 | 2.0 | 1,125 | 0.6 | 79,950 | 1.3 | 69,520 | 1.7 |
| MIDDLE ATLANTIC: | | | | | | | | | | | | | |
| New York | 306 | 301 | 1,586,443 | 129,401 | 7.2 | 1,072,842 | 12.4 | 5,665 | 2.8 | 993,601 | 16.1 | 385,018 | 9.5 |
| New Jersey | 60 | 68 | 349,556 | 74,911 | 4.1 | 273,050 | 3.2 | 2,220 | 1.1 | 8,883 | 0.1 | 147,870 | 3.7 |
| Pennsylvania | 226 | 206 | 1,321,975 | 137,386 | 7.6 | 1,068,835 | 12.3 | 14,440 | 7.0 | 165,055 | 2.7 | 434,348 | 10.7 |
| SOUTH ATLANTIC: | | | | | | | | | | | | | |
| Delaware | 13 | 10 | 34,315 | 5,885 | 0.3 | 28,725 | 0.3 | 0 | 0.0 | 0 | 0.0 | 13,735 | 0.3 |
| Maryland | 45 | 37 | 191,523 | 21,724 | 1.2 | 105,450 | 1.2 | 955 | 0.5 | 2,120 | 0.0 | 61,936 | 1.5 |
| District of Columbia | 3 | 3 | 90,000 | 5,800 | 0.3 | 145,000 | 1.7 | 0 | 0.0 | 0 | 0.0 | 25,050 | 0.6 |
| Virginia | 92 | 99 | 167,941 | 8,701 | 0.5 | 82,162 | 1.0 | 5,747 | 2.8 | 76,551 | 1.2 | 40,052 | 0.9 |
| West Virginia | 64 | 55 | 351,620 | 14,957 | 0.8 | 310,280 | 3.6 | 19,090 | 9.3 | 8,410 | 0.1 | 83,385 | 2.1 |
| North Carolina | 140 | 121 | 221,117 | 21,268 | 1.2 | 63,875 | 0.7 | 350 | 0.2 | 126,070 | 2.2 | 35,355 | 0.9 |
| South Carolina | 72 | 73 | 396,819 | 10,115 | 0.6 | 46,000 | 0.5 | 3,562 | 1.7 | 321,250 | 5.2 | 22,113 | 0.6 |
| Georgia | 152 | 144 | 250,718 | 37,843 | 2.0 | 59,725 | 0.7 | 3,345 | 1.6 | 262,495 | 4.2 | 68,978 | 1.8 |
| Florida | 78 | 91 | 73,320 | 21,663 | 1.2 | 50,024 | 0.6 | 4,235 | 2.1 | 2,736 | 0.0 | 35,545 | 0.9 |
| EAST NORTH CENTRAL: | | | | | | | | | | | | | |
| Ohio | 271 | 234 | 1,098,433 | 164,718 | 9.1 | 898,662 | 10.5 | 11,218 | 5.5 | 24,236 | 0.4 | 363,040 | 9.0 |
| Indiana | 199 | 163 | 373,113 | 62,633 | 3.4 | 251,702 | 2.9 | 6,060 | 2.9 | 21,236 | 0.3 | 164,792 | 4.1 |
| Illinois | 247 | 255 | 961,814 | 150,132 | 8.4 | 734,720 | 8.5 | 4,127 | 2.0 | 73,591 | 1.2 | 346,122 | 8.6 |
| Michigan | 190 | 217 | 712,624 | 56,451 | 3.1 | 357,615 | 4.2 | 2,069 | 1.0 | 228,353 | 3.6 | 162,418 | 4.0 |
| Wisconsin | 267 | 226 | 402,779 | 69,963 | 3.9 | 184,216 | 2.1 | 5,027 | 2.5 | 195,473 | 3.1 | 103,370 | 2.5 |
| WEST NORTH CENTRAL: | | | | | | | | | | | | | |
| Minnesota | 219 | 199 | 299,131 | 39,878 | 2.2 | 116,687 | 1.4 | 7,970 | 3.9 | 145,247 | 2.3 | 83,479 | 2.1 |
| Iowa | 224 | 215 | 298,244 | 63,298 | 3.5 | 115,872 | 1.3 | 4,286 | 2.1 | 169,614 | 2.8 | 106,096 | 2.6 |
| Missouri | 234 | 198 | 397,911 | 64,026 | 3.6 | 389,452 | 4.5 | 6,366 | 3.1 | 17,670 | 0.3 | 152,171 | 3.8 |
| North Dakota | 119 | 128 | 25,433 | 19,435 | 1.1 | 6,600 | 0.0 | 3,100 | 1.5 | 0 | 0.0 | 24,276 | 0.6 |
| South Dakota | 112 | 110 | 30,760 | 7,597 | 0.4 | 12,875 | 0.2 | 9,253 | 4.5 | 6,050 | 0.0 | 15,045 | 0.4 |
| Nebraska | 251 | 226 | 112,106 | 27,748 | 1.5 | 51,790 | 0.6 | 11,646 | 5.7 | 12,036 | 0.2 | 50,240 | 1.2 |
| Kansas | 260 | 210 | 149,707 | 43,582 | 2.4 | 94,612 | 1.1 | 18,476 | 9.0 | 10,008 | 0.2 | 68,092 | 1.7 |
| EAST SOUTH CENTRAL: | | | | | | | | | | | | | |
| Kentucky | 111 | 119 | 109,483 | 22,237 | 1.2 | 94,275 | 1.1 | 2,210 | 1.1 | 115 | 0.0 | 46,446 | 1.1 |
| Tennessee | 92 | 91 | 172,280 | 17,585 | 0.9 | 67,025 | 0.8 | 375 | 0.2 | 125,865 | 2.0 | 48,412 | 1.2 |
| Alabama | 62 | 64 | 192,918 | 26,837 | 1.6 | 131,108 | 1.5 | 0 | 0.0 | 102,400 | 1.7 | 76,951 | 1.9 |
| Mississippi | 93 | 94 | 42,888 | 17,704 | 0.9 | 26,816 | 0.3 | 1,065 | 0.5 | 0 | 0.0 | 27,057 | 0.7 |
| WEST SOUTH CENTRAL: | | | | | | | | | | | | | |
| Arkansas | 82 | 86 | 59,277 | 27,130 | 1.5 | 38,417 | 0.4 | 1,361 | 0.7 | 720 | 0.0 | 34,625 | 0.9 |
| Louisiana | 67 | 64 | 87,674 | 33,667 | 1.9 | 55,327 | 0.6 | 4,190 | 2.0 | 0 | 0.0 | 34,630 | 0.9 |
| Oklahoma | 156 | 165 | 104,328 | 47,594 | 2.6 | 48,034 | 0.6 | 10,110 | 4.9 | 1,718 | 0.0 | 61,161 | 1.5 |
| Texas | 240 | 257 | 233,784 | 75,430 | 4.1 | 160,597 | 1.9 | 19,871 | 9.7 | 10,077 | 0.2 | 115,703 | 2.8 |
| MOUNTAIN: | | | | | | | | | | | | | |
| Montana | 58 | 67 | 227,791 | 12,141 | 0.7 | 3,000 | 0.0 | 878 | 0.4 | 342,480 | 5.6 | 14,146 | 0.4 |
| Idaho | 39 | 54 | 121,160 | 2,745 | 0.1 | 0 | 0.0 | 40 | 0.0 | 222,471 | 3.6 | 2,990 | 0.0 |
| Wyoming | 34 | 38 | 21,699 | 6,925 | 0.4 | 16,316 | 0.2 | 1,613 | 0.8 | 7,560 | 0.1 | 14,342 | 0.4 |
| Colorado | 64 | 73 | 136,605 | 23,034 | 1.2 | 68,845 | 0.9 | 380 | 0.1 | 79,708 | 1.3 | 51,910 | 1.3 |
| New Mexico | 27 | 27 | 10,506 | 7,008 | 0.4 | 3,010 | 0.0 | 2,895 | 1.5 | 799 | 0.0 | 6,472 | 0.1 |
| Arizona | 30 | 31 | 58,439 | 9,965 | 0.6 | 17,400 | 0.2 | 2,800 | 1.4 | 38,760 | 0.6 | 18,115 | 0.5 |
| Utah | 36 | 58 | 85,380 | 11,919 | 0.7 | 20,000 | 0.2 | 0 | 0.0 | 101,844 | 1.6 | 15,820 | 0.4 |
| Nevada | 12 | 17 | 22,350 | 915 | 0.0 | 1,400 | 0.0 | 282 | 0.1 | 12,850 | 0.2 | 1,500 | 0.0 |
| PACIFIC: | | | | | | | | | | | | | |
| Washington | 86 | 92 | 416,278 | 16,629 | 0.9 | 70,155 | 0.8 | 430 | 0.2 | 443,139 | 7.2 | 44,722 | 1.1 |
| Oregon | 58 | 70 | 144,708 | 16,845 | 0.9 | 40,000 | 0.5 | 202 | 0.1 | 125,970 | 2.0 | 35,961 | 0.9 |
| California | 83 | 135 | 978,423 | 33,888 | 1.9 | 281,386 | 3.2 | 3,075 | 1.5 | 1,129,954 | 18.3 | 91,012 | 2.2 |

# Prime Movers in Central Stations Total 19,737,361 Hp.

## Analysis of Development of Electric Light and Power Companies Indicates a Total of 13,331,933 Hp. in Steam Motors, of Which 87 per Cent Is for Steam Turbines— Boiler Installation Totals 4,042,922 Hp.




PREDOMINANCE OF THE STEAM TURBINE AND WATERWHEEL AS A PRIME MOVER IN THE CENTRAL GENERATING PLANTS OF THE COUNTRY

ON OCT. 1, 1921, there were 5,532 central generating plants in the United States with a total prime-mover rating of 19,737,361 hp. and a total installed generator rating of 14,466,915 kw. The total rating of the prime movers of the central stations in 1902 was only 1,818,413 hp., indicating an increase during the nineteen-year period of about 900 per cent. This is slightly less than the increase in generator rating for the same period, which was about 1,092 per cent. The increase in prime mover rating during the period from Jan. 1, 1920, to Oct. 1, 1921, was 1,170,712 hp., or at the rate of 3.9 per cent per annum. This yearly increase is about 7 per cent below the average reported from 1907 to 1920.

Detailed data on the central generating plants of the country will be found in the accompanying table. A similar analysis covering the period from 1902 to 1919 inclusive appears in the Aug. 14, 1920, issue of the *Electrical World*. The data have been based almost entirely on reports submitted in connection with the preparation of the 1921-1922 McGraw Central Station Directory and Data Book.

The total rating of the steam motors was reported as 13,331,933 hp., of which 86.5 per cent was attributed to steam turbines. The first reliable data comparing the total rating of steam engines and steam turbines in the central stations of the country were as of Jan. 1, 1920. At that time the total rating of the steam motors was reported as 11,476,600 hp., of which 84.5 per cent was attributed to steam turbines. The growth in the use of the steam turbine to the gradual elimination of the steam engine is further emphasized by the fact that during the twenty-one-month period from Jan. 1, 1920, to Oct. 1, 1921, the total rating of the installed steam turbines was increased by 1,487,367 hp., while the total rating of the installed steam engines was increased by only 31,733 hp.

The East North Central States lead in the total rating of both steam engines and steam turbines, although the total rating of the steam turbines is about six and four-tenths times the total rating of the steam engine. Ohio leads in the percentage of installed steam engines, and New York leads in the percentage of installed steam turbines.

The figures on the total rating of the installed waterwheels are those given out by the United States Geological Survey and based on its recent detailed investigations. These figures indicate that the rating of the waterwheels installed in central generating plants increased by 822,845 hp. subsequent to Jan. 1, 1920, an increase of about 15.3 per cent.

California and New York are in a distinct class as regards total hydro-electric development by central stations. California leads with 1,129,954 hp., New York following closely with 993,601 hp. Washington is third, reporting a development in central-station hydro-electric plants of 443,139 hp. The Pacific States lead in the total hydro-electric development by central stations, followed by the Middle Atlantic States.

The accompanying diagrams indicate the importance of the four types of prime movers in the various sections of the country.

# Average Street-Lighting Cost About $2 per Capita*

## The Highest Cost Is $4.81—That for the Entire United States Is About 75 Cents—Ornamental Systems and "White Ways"

BY A. F. DICKERSON
Chief Engineer Illuminating Engineering Laboratory, General Electric Company, Schenectady, N. Y.

THE average total municipal expenditure per capita in 1919 for all cities in the United States of more than 30,000 population was $21.23. Of the $5.25 spent for safety and protection, only 72 cents was for street lighting. The over-all service purchased by the expenditure of $5.25 could be greatly improved by a reallotment which would increase the street-lighting budget by a few cents.

What is a fair yearly expenditure per capita for street lighting? Local conditions, electric rates, area, per capita and many things influence this figure. For the whole United States it is about 75 cents. There are a few cities spending more than $3, the highest being $4.81. The average for the fifty best lighted cities will be about $2.05.

In New York State, among all cities and villages of more than 5,000 population, only one expends over $2.50 per capita for street lighting. Three expend between $2 and $2.50, five between $1.50 and $2, and twenty-four between $1 and $1.50. Others are below $1. The best-lighted cities both in New York and in the entire United States are now paying from $1.50 to $2 per capita for street lighting.

The yearly cost of street lighting will vary from about 2 cents per linear foot of street for the poorly lighted village to more than $5 for an intensive "white way" system such as that on Market Street, San Francisco. The latter figure may seem extravagant and would be for a municipality, but such lighting is considered as a commercial investment and its cost is usually borne by abutting property owners and merchants.

### SMALL INITIAL COST

Street lighting occupies an important place in the "city beautiful" movement. A line of ornamental standards forms the one unifying architectural element of a street. Practical needs should not be given consideration ahead of the esthetic, for it is always possible to combine the two satisfactorily and economically. The visible portion of an ornamental street-lighting system represents less than half the total cost. The fixed-charge part of a rate, covering interest and depreciation, is usually from one-seventh to one-eighth of the total installation cost, so that for each dollar additional in the yearly rate approximately $15 may be added to the initial cost of the standard and lighting unit. Therefore it is usually "penny wise and pound foolish" to consider first cost in the selection of these items.

In an ornamental system nearly one-half the rate is usually the interest and depreciation on the original installation. Operation, maintenance of the entire system, power, taxes, commercial costs, insurance, overhead costs and profit make up the rest. In the overhead system these latter items represent a much larger portion of the total than in the underground, so that greater consideration should be given to efficiency of the unit and ease of maintenance. In either case a large saving may always be effected by the use of as few large lamps as possible rather than a great number of small ones. Cleanness is of extreme importance, as often a few months' accumulation of dirt will decrease the output of a fixture by a third or more.

The successful "white way" system must brilliantly illuminate the street and abutting building façades at night and be an architectural ornament in the daytime. For such lighting, the 6.6-amp. ornamental luminous arc and the 600, 1,000, 1,500 and 2,500-cp. tungsten lamps, in a great variety of fixtures, are available. In many large cities it is often desirable to install two or more of these units on one standard, making an "intensive" or "super-white way." Examples are the main streets of Salt Lake, San Francisco, Los Angeles and Saratoga.

Large units, such as the 4, 5 and 6.6-amp. pendent luminous arc and the 250, 400, 600 and 1,000-cp. tungsten lamps, are usually spaced from 150 ft. to 300 ft. on one or both sides of the street, depending on traffic conditions. These should be mounted from 20 ft. to 25 ft. above the street, and the tungsten lamps should usually be equipped with refractors, especially where the spacings are long.

RECOMMENDATIONS ON LIGHTING STREETS*

| Class | Available Lamps | Mounting Height (Ft.) | Spacing (Ft.) |
|---|---|---|---|
| Intensive "White ways" | 6.6-amp. luminous - arc 1,000, 1,500 and 2,500-cp. tungsten lamps | 18–25 | 100–150 |
| "White ways" | 4-amp. and 6.6-amp. luminous arc 600, 1,000 and 1,500-cp. tungsten lamps | 14–16 | 80–125 |
| Wholesale manufacturing districts and thoroughfares | 4-amp. and 6.6-amp. luminous arcs, 250, 400, 600 and 1,000-cp. tungsten lamps | 20–30 | 150–300 |
| Residential streets, boulevards and parks | 4-amp. luminous arc, 250, 400 and 600-cp. tungsten lamps | 12–25 | 100–300 |
| Outlying districts and alleys | 100-cp. and 250-cp. tungsten lamps | 15–18 | 100–300 |
| Highways | 250-cp. lamps | 30–35 | 250–400 |

* The suggestions as outlined above are general and naturally each proposition will demand thorough investigation and specific recommendations.

Most residential streets now have 250, 400 and 600-cp. pendent tungsten lamp fixtures or 4-amp. luminous lamps at street intersections and sometimes at intermediate points, with mounting heights from 20 ft. to 25 ft. The modern tendency, however, is toward ornamental standards with small lamps, usually 250 cp., spaced staggered, or in central parkings, with one standard to each 80 ft. to 125 ft. of street, or opposite on wide streets, with approximately 100-ft. to 125-ft. spacings. The most satisfactory lamp height is about 12 ft. In parks it is customary to light the important roadways as described above and the large open areas with high pendent units equipped with large lamps.

In unsettled portions of cities and in small villages a low roadway illumination is sufficient and can best be secured with 100-cp. and 250-cp. tungsten lamps in center span or bracket-type fixtures. In most cases spacings should be from 100 ft. to 250 ft., but longer spacings may be used with 250-cp. or larger lamps when equipped with a refractor. Mounting heights should be from 15 ft. to 25 ft., depending on the distance between units and the size of lamps used. When the main street of a village is also a through state highway, much higher intensities are required, and often it is desirable and advantageous to install ornamental fixtures.

*Excerpts from remarks made recently before the New York State conference of mayors and other city officials at Poughkeepsie, N. Y.

# Investment Charge as Applied to Electric Power Rates

## Interest and Depreciation Are Constant Regardless of Energy Used—How Diversity Factor Benefits Customers—Power Company Virtually Acts as Banker for Its Customers—Law of Average

By R. E. RICHARDSON
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CENTRAL station companies in serving power customers have occasion from time to time to adjust the demand bases upon which power bills are rendered. Usually this involves an increase in the demand charge, and many customers are prone to question the necessity of such an increase. They all realize that the power company must carry an investment in plant and equipment in order to stand ready to give service at any time, but many of these customers are frequently loath to admit the equity of these charges. Mr. Richardson in his article has made a clear and careful analysis of the fundamental reasons for investment charges, drawing an interesting comparison of the demand charge with a loan from a bank. Many of the questions which customers have raised regarding the determination of their demands are fully explained here. The article contains many points of value to the central station company in the application of its power schedules.

WHAT is the necessity of the charge frequently spoken of as the demand charge or the investment charge in an electric power rate, and how should it be applied to be equitable to both consumer and producer?

The so-called demand charge in every power rate is, or should be, such as to protect the investment which the power company makes in the way of plant, line capacity, etc., or supplies to the consumer being served, the consumer thus being relieved of the investment and the power company assuming the burden.

As different diversity factors are obtained, varying from one up to six or possibly higher, in the case of very small motors, with various kinds or classes of business, the power company in the designing of rates for these different classes or sizes of installations endeavors to make this fixed investment charge such as will return monthly an amount sufficient to cover interest and depreciation (at the rate approved by the state commission) on the money invested by the power company for the benefit of the consumer. This investment by the power company, represented by engines, dynamos, transmission lines, distributing lines, transformers, meters, buildings, etc., essential to give this service is actually, not theoretically, held for the exclusive use of the consumer.

### INTEREST AND DEPRECIATION CONSTANT

Any one who will intelligently and honestly analyze the situation will see that this interest and depreciation cost to the power company goes on from month to month entirely independent and entirely irrespective of whether or not the consumer uses any energy; in other words, just as long as the power company holds this investment for the consumer's use, which it does until the consumer's contract expires. As each consumer has the right and privilege at any moment during any day to throw a switch and take from the power company energy to supply him power not only up to but in excess of the amount on which his monthly investment charge has been based, it must be evident to any intelligent and fair-minded person that the power company, to be reasonably sure of even getting interest and depreciation on those moneys which it has invested for the consumer's benefit, must get an amount which is directly proportioned to the call or demand upon the power company which a consumer is entitled to, can and in all probability will make.

If he makes a demand upon the power company's equipment of 100 hp. during one month it is not only possible but more than probable that he will make an equal or greater demand the next or some later month. And he demands from the power company that it be ready, upon a fraction of a second's notice or, to be absolutely accurate, without any notice, to furnish him the necessary capacity in station, lines, transformers, etc., to supply his demand.

### TWO DISTINCT COST FACTORS

To serve any consumer, a power consumer especially, the power company incurs two specific and separate costs; one, a fixed or overhead cost, which includes interest and depreciation on the investment in machinery lines and line equipment for the consumer's use and other fixed overhead costs, regardless of whether or not the consumer takes any energy; the other, a production cost, whose unit cost varies to an extent with the number of units of energy or kilowatt-hours he consumes per month, the regularity per day with which he consumes the energy and the time of the day at which the energy is consumed, i.e., whether that time is at an hour when the power company's plant is carrying a load nearly or up to its capacity, or when it has capacity to spare.

In the designing of a rate it is attempted to embody all of the above factors, giving to the consumer all the advantages possible due to the average diversity which his class of business gives, the regularity of his consumption, time of day of use, and to the quantity of kilowatt-hours he uses per month, which last item, in connection with his maximum demand, determines his load factor. On the other hand, a rate should be such that if the consumer fails to use the service during the month, he should at least pay interest and depreciation on that investment which the power company is holding for his use and cannot promptly dispose of or sell.

If the preceding statements are correct, then it must follow that the power company must have a payment each month based on that investment represented by plant, line equipment, etc., which it has made and is holding in readiness for the exclusive use of any one consumer.

If a power user requires 100 hp. during the month of January, we will say, it is no more than reasonable to expect that he will again require some day or hour in February or March, 100 hp. or more, but whether he actually does or does not, if he has called for 100 hp. in January the power company is obligated to and is not filling its obligations to the power user if it is not ready to deliver to him 100 hp. in February, March or any other month while he is taking service from its lines, unless he actually reduces the size of his motor equipment. Even then the power company must be properly notified, otherwise it still will be holding the full 100 hp. of its investment for his use.

As previously stated, in the designing of a rate, the endeavor is made to take into consideration all controlling factors and, as a matter of fact, the consumer is given the benefit of the doubt in almost every case, as the investment portion of the rate (namely the so-called demand charge) is, it might be said, always considerably less than would cover the actual investment cost to the power company.

This can be most readily proved by assuming that for one month all consumers fail to use any energy, in which case the power company would be entitled to bill only on the basis of the demand or minimum charges contained in the rates. If such is done it will be found that in 90 per cent or more of all the power companies in this country, the sum of all those demands or minimum charges would not begin to equal the investment and other overhead charges incurred by them during that month's period.

### POWER COMPANY ACTS AS BANKER

It is evident, therefore, that a power company in reality acts as a banker and a manufacturer for the consumer.

The investment portion of a rate is a banking rate, or, in other words, the power company invests certain moneys in machinery and electrical equipment, relieving the consumer of making this investment and, due to the diversity factor obtained by furnishing service to many consumers, the investment made by the power company per horsepower or kilowatt-hour maximum demand requirement of the consumer is materially less than though the consumer had to make the investment in a private plant, and the consumer necessarily gets the advantage of this decreased investment coming from the average diversity factor. This the power company recognizes and gives the full benefit to the consumer.

The power company in reality says to the consumer, "We will loan to you enough money or loan to you sufficient power-producing machinery to run the power end of your business."

If the consumer asks for a 100-hp. loan during any month, it certainly is reasonable to suppose that he will do as much or more business some other month and will, therefore, require that full loan again; just what day, hour or month the power company has no means of knowing, and, therefore, as previously pointed out, it must hold this 100 hp. ready to loan to him whenever he calls for it.

It is evident that this investment which the power company makes cannot be made on the basis of a month's loan, as the very nature of the business is such that it cannot base its charge on a month's loan, as it is not possible for the power company to know the demand. Consequently the loan demanded will be good until the month has passed, and therefore the power company must hold ready for the consumer's use an amount of power represented by dollars equal to the maximum amount which he used or borrowed during any of the preceding months.

### DELIVERY OF SERVICE MUST BE INSTANTANEOUS

All those who have followed the electrical industry for any reasonable period know that there is a vital investment factor in the electric power business which differs from any other business in the world, namely, that the instant any consumer requires, as per his contract, a maximum rate of delivery of service and product which represents investment, the power company must fulfill this contract, and must be ready with sufficient machinery and means of conveyance to deliver instantly and manufacture at that instant and in the units demanded this maximum service required.

In the case of telephone service, if the main switchboard or main trunk lines are full or busy, you are told to wait. A telegram is not sent until a company has a free wire or the operator has the time. With a street railway or subway, if the car is not there you wait for it. In the case of a steam road, there are prescribed times when you can start from this or that point. In the case of water or gas service you are supposed to get instantaneous service. In the case of those two latter services, however, both gas and water can be stored in holders or reservoirs prior to the required time of delivery.

As before stated, the power company has no means of knowing what minute or hour of day any one of these consumers may require their full quota of service, and, further, as the amount of service and the time the service is required varies with almost every consumer, it is absolutely impossible for a power company to make an equitable rate based on anything other than the average service requirements of this or that class of consumer. Such being the case, the fairest, most equitable and only safe way for both producer and consumer is to base the investment charge on that average investment per horsepower or kilowatt-hour demand which has been found through experience, tests, records, etc., to be a true average for any class of service. This average is based on a period of not less than one year, and the investment portion of a rate is accordingly based on not less than one year's loan.

As the first part of a rate contains the banking features, let us compare that part with the banker. When a consumer establishes a 100-hp. demand on an electric power plant he in effect borrows from the power company a 100-hp. plant or an amount of money represented by the investment which the power company must hold in readiness to give this 100-hp. service. We will say, in the case of the power company plant, that, diversity considered, this is $15,000. It thus follows that the power company is holding $15,000 worth of capacity for this consumer's use. If he did not get his power from the power company the consumer would have to take from his own capital or go to a bank and borrow more than $15,000 with which to

build his own plant. And the amount would probably be considerably more than $15,000, as he would have no diversity which would be credited to him in the power company's rate.

If on the one hand he demands that the power company shall be ready to deliver to him 100 hp. at any moment, the power company surely cannot loan that $15,000 or any part of it to some one else. On the other hand, if the customer borrowed the amount from the bank and could use or check against that $15,000 at any moment, the bank would certainly not charge against him interest on only that part of the money he checked against, but would charge him interest on the full $15,000, because it could not loan it to any one else owing to the customer's right to check against it at any moment. If the customer had a standing loan of $15,000 on the bank or had the privilege of drawing against the bank for that sum at any time, be it for one year, thirteen, fourteen or twenty-four months, or any period, the bank, at the end of any fiscal or calendar year, would certainly not reduce the monthly interest charge based on $15,000 unless the customer actually returned a portion or all of the loan, thereby decreasing or entirely canceling the bank's obligation.

A power company in reality acts as a banker and a manufacturer for the consumer. When a power user establishes a maximum demand it is like establishing a maximum loan from a bank. The difference between the two is that if the borrower from the bank returns a portion or all of the money, the bank's obligation not only ceases to the extent of the remaining loan, if any, but it is not obligated to make any further loan to the customer even if it has the money on hand.

In the case of power consumers, when they establish a maximum demand it is like establishing a maximum loan from a bank. The difference between the two is that if the borrower from the bank returns a portion or all of the money, the bank's obligation not only ceases to the extent of the remaining loan, if any, but it is not obligated to make any further loan to the customer even if it has the money on hand to loan.

In the case of the power company, when a consumer once establishes a monthly demand that demand really represents the loan that it is reasonable to suppose he will require as long as he does business, or is likely to and is entitled to demand from the power company unless he either reduces his business or reduces his demand on the power company, by putting in some machinery of his own, or there is some marked increased economy in the use of power. Just as long as he continues to operate his business in a way similar to the manner in which he advised the power company he intended to operate when he contracted with the power company, or in a manner as shown later on when he was being served by the power company, the power company is not safe or justified in assuming for a moment that the consumer is not likely to call upon it for an amount of power equal to the amount contracted for or the maximum shown that the consumer required during any month during which service was given to him. Such being the case, the maximum demand or loaned investment once established should continue for a period of not less than one year.

### Power Company Must Renew Contract

In making the comparison between the banker and the power company it must not be overlooked that there is one other marked difference in favor of the banker, in that if a loan is made from a bank, at the end of the loan period (contract period) the banker is under no obligation to renew that loan even though the party making the loan may furnish adequate security as a protection to the loan and has promptly paid his interest charges. If it does renew the loan the bank may call for a higher rate of interest. On the other hand, the power company, being a public utility company, is obliged to take all kinds of chances as to the financial responsibility of the customers to whom it makes loans and is obliged not only to continue to make the loan originally asked for, but to increase that loan if the consumer's requirements demand an increase. It also must not be forgotten that a bank's dollar does not wear out, or if it does it is replaced at no expense to the bank. In the making of a power contract the first month's contract kilowatt charge should be based either on the initial requirements or demand, based on the consumer's assumed needs, or the demand developed during his first month of service if at the time of making the contract his requirements were not sufficiently known to predetermine the initial demand. This first demand would establish his first month's bill and he should be billed on that demand continuously for a period of not less than another eleven months, unless he creates a higher demand, in which case the new higher demand should be taken as a basis (an increased loan), and this new increased demand should be used for billing purposes for another eleven-month period. If, however, during that month he created another demand in excess of the one on which he was being billed, then and at the end of this twelfth month he would be billed on the highest demand developed during the preceding eleven months.

### How Established Demand Can Be Decreased

When the consumer had operated for twelve months on that highest demand, dating from the time it was first created, he would go on to a lower demand, provided that he had not equaled or exceeded the maximum demand developed during the preceding eleven months.

A reasonable insurance for, or the security of, a power company's investment would be absolutely lost if a monthly basis was established, and it would also be practically lost and the greatest injustice would be done to many consumers if some were permitted to establish a new demand at the end of every twelve months regardless of the demand that was created during the preceding twelve months. In order to protect its investment the power company would immediately have to establish new and much higher monthly investment charges per kilowatt-hour demand and these charges would have to be in the nature of a guess or gamble, and would result in the most inequitable and unfair condition to both the consumer and the power company. If a power company was fortunate it might fix rates so as to get back just a reasonable return on its investment; it might get back a great deal more than it was entitled to or wanted and, on the other hand, it might and probably would fail to begin to get back anything approaching a fair return on the investment made to serve its consumers.

# Copper-Clad Steel Wire Advocated for Transmission Circuits

## Its Non-Corrosive Qualities, Great Strength and Low Cost Make It Useful for Rural Lines, Long Spans and Lightly Loaded High-Voltage Lines—Reliable Data Now Available

By B. C. DENNISON
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BECAUSE of certain qualities which are peculiar to copper-clad steel wire it may be used to advantage in many cases to replace aluminum, copper or galvanized steel in long spans, in telephone lines paralleling high-tension lines, in overhead ground wires, in rural districts with light loads, in messenger strands supporting power or telephone cables and in various signaling systems.

Normal copper-clad steel wire is about 8 per cent lighter than copper and has a breaking strength exceeding that of copper by an amount varying from 20 per cent for the larger sizes (No. 4/0) to 55 per cent for No. 12. Stranded cables of copper-clad steel may be expected to be at least 50 per cent stronger than the corresponding cables of hard-drawn copper. A so-called "extra-high-tensile" copper-clad steel wire is now on the market which has a strength 150 per cent greater than copper owing to the use of a high-carbon steel core.

Obviously, copper-clad steel wire cannot always be substituted for copper to advantage. Its general field of usefulness is in those applications where the size of wire is determined by requirements of mechanical strength rather than conductivity, or where galvanized wire is subject to corrosion and depreciation.

For long spans where the strength of hard-drawn copper is insufficient the copper-clad steel wire finds a ready application. Compared with silicon-bronze or phosphor-bronze wire, copper-clad steel has about the same strength and conductivity with materially lower first cost. Extra-high tensile-strength copper-clad steel adds to the advantage of lower cost a strength twice that of bronze. Several examples of river crossings are given in Table IV.

A special case of the use of copper-clad steel for long spans is for power-company telephone circuits strung on the steel towers of the transmission system with spans that are too long to permit the use of copper conductors. Typical loading tables for normal copper-clad steel wire and cables are given in Tables II and

TABLE I—COMPARATIVE VALUES OF WEIGHT AND RESISTANCE PER 1,000 FT. FOR HARD-DRAWN COPPER-CLAD STEEL AND COPPER WIRES

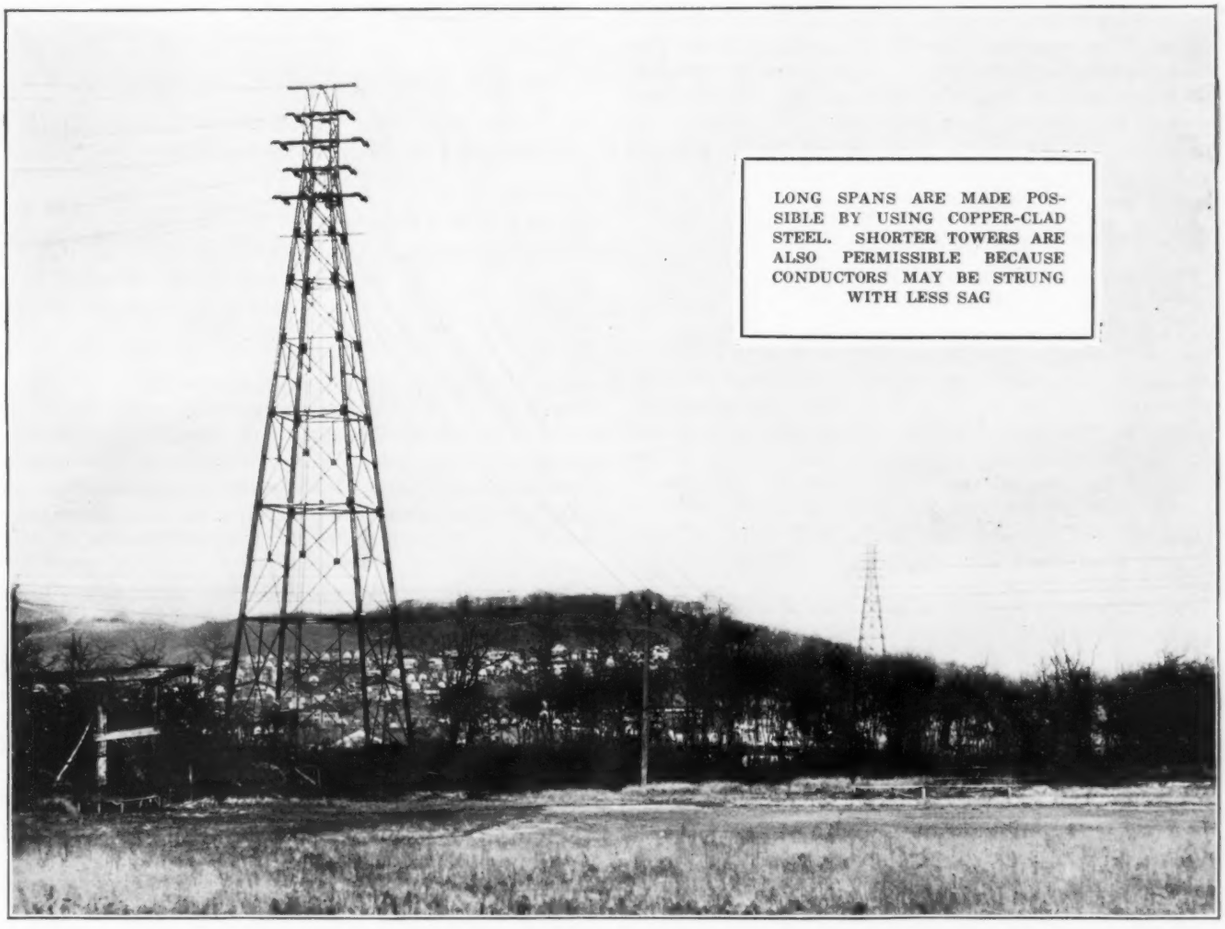
| Size A.W.G. (B.&S.) | Diam. (in.) | Av. Weight in Lb. per 1,000 Ft. | | Av. Breaking Load (Lb.) | | Av. Resistance in Ohms per 1,000 Ft. at 68 deg. F. | | | Size A.W.G. (B.&S.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Copper-Clad Steel | | Copper | |
| | | Copper-Clad Steel | Copper | Copper-Clad Steel | Copper | 30% Cond. | 40% Cond. | | |
| 4/0 | 0.460 | 585 | 641 | 9,850 | 8,140 | 0.165 | 0.124 | 0.0495 | 0000 |
| 3/0 | 0.410 | 467 | 508 | 8,280 | 6,730 | 0.208 | 0.156 | 0.0624 | 000 |
| 2/0 | 0.365 | 370 | 403 | 6,850 | 5,540 | 0.262 | 0.197 | 0.0787 | 00 |
| 1/0 | 0.325 | 293 | 319 | 5,700 | 4,520 | 0.331 | 0.248 | 0.0993 | 0 |
| 1 | 0.289 | 231 | 253 | 4,800 | 3,680 | 0.421 | 0.316 | 0.126 | 1 |
| 2 | 0.258 | 184 | 201 | 4,000 | 3,000 | 0.531 | 0.398 | 0.159 | 2 |
| 3 | 0.229 | 146 | 159 | 3,200 | 2,440 | 0.670 | 0.503 | 0.201 | 3 |
| 4 | 0.204 | 116 | 126 | 2,650 | 1,970 | 0.844 | 0.633 | 0.253 | 4 |
| 5 | 0.182 | 92 | 100 | 2,200 | 1,590 | 1.06 | 0.799 | 0.320 | 5 |
| 6 | 0.162 | 73 | 79.5 | 1,800 | 1,280 | 1.34 | 1.01 | 0.403 | 6 |
| 7 | 0.144 | 58 | 63.0 | 1,450 | 1,030 | 1.69 | 1.27 | 0.508 | 7 |
| 8 | 0.128 | 46 | 50.0 | 1,200 | 828 | 2.13 | 1.60 | 0.641 | 8 |
| 9 | 0.114 | 37 | 39.6 | 970 | 663 | 2.69 | 2.02 | 0.808 | 9 |
| 10 | 0.102 | 29 | 31.4 | 800 | 528 | 3.39 | 2.55 | 1.02 | 10 |
| 11 | 0.091 | 23 | 24.9 | 645 | 423 | 4.28 | 3.21 | 1.29 | 11 |
| 12 | 0.081 | 18 | 19.8 | 520 | 337 | 5.39 | 4.05 | 1.62 | 12 |
| 13 | 0.072 | 14.38 | 15.7 | 415 | 268 | 6.80 | 5.11 | 2.04 | 13 |
| 14 | 0.064 | 11.55 | 12.4 | 330 | 214 | 8.58 | 6.44 | 2.58 | 14 |

TABLE II—LOADING TABLES FOR COPPER-CLAD STEEL BARE HARD-DRAWN WIRE

Based on the requirements of the National Electrical Safety Code (Compiled by the Copper-Clad Steel Company for copper-weld wire)

| A.W.G. | Diam. | Cross-Section | | Breaking Load (Lb.) | Allowable Tension (Lb.) | Lb. per Linear Foot | | | Max. Load in Plane of Resultant—Lb./Linear Ft. | | | Modulus × Area | Ohms Resistance per 1,000 Ft. at 68 Deg. F. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Vertical | | Horizontal Wind Pressure, 8 Lb. Sq.Ft. | Heavy | Medium, (¾ Heavy) | Light, (½ Medium) | | 40 per Cent Cond. | 30 per Cent Cond. |
| | | Circ. mils | Sq. In. | | | Dead Wt. | Dead Plus ½-in. Ice | | | | | | | |
| 4/0 | 0.460 | 211,600 | 0.1662 | 9,850 | 4,925 | 0.585 | 1.183 | 0.973 | 1.532 | 1.102 | 0.732 | 3,324,000 | 0.124 | 0.165 |
| 3/0 | 0.410 | 167,800 | 0.1318 | 8,280 | 4,140 | 0.467 | 1.034 | 0.940 | 1.398 | 0.933 | 0.622 | 2,636,000 | 0.156 | 0.208 |
| 2/0 | 0.365 | 133,100 | 0.1045 | 6,850 | 3,425 | 0.370 | 0.909 | 0.910 | 1.285 | 0.857 | 0.572 | 2,090,000 | 0.197 | 0.262 |
| 1/0 | 0.325 | 105,500 | 0.08289 | 5,700 | 2,850 | 0.293 | 0.807 | 0.883 | 1.195 | 0.797 | 0.531 | 1,658,000 | 0.248 | 0.331 |
| 1 | 0.289 | 83,690 | 0.06573 | 4,800 | 2,400 | 0.231 | 0.723 | 0.859 | 1.125 | 0.750 | 0.500 | 1,315,000 | 0.316 | 0.421 |
| 2 | 0.258 | 66,370 | 0.05213 | 4,000 | 2,000 | 0.184 | 0.656 | 0.839 | 1.065 | 0.710 | 0.474 | 1,043,000 | 0.398 | 0.531 |
| 3 | 0.229 | 52,640 | 0.04134 | 3,200 | 1,600 | 0.146 | 0.600 | 0.819 | 1.017 | 0.677 | 0.452 | 826,800 | 0.503 | 0.670 |
| 4 | 0.204 | 41,740 | 0.03278 | 2,650 | 1,325 | 0.116 | 0.554 | 0.803 | 0.974 | 0.649 | 0.433 | 655,600 | 0.633 | 0.844 |
| 5 | 0.182 | 33,100 | 0.02600 | 2,200 | 1,100 | 0.092 | 0.517 | 0.788 | 0.942 | 0.628 | 0.419 | 520,000 | 0.799 | 1.06 |
| 6 | 0.162 | 26,250 | 0.02062 | 1,800 | 900 | 0.073 | 0.485 | 0.775 | 0.914 | 0.610 | 0.406 | 412,400 | 1.01 | 1.34 |
| 8 | 0.128 | 16,510 | 0.01297 | 1,200 | 600 | 0.046 | 0.437 | 0.752 | 0.870 | 0.580 | 0.387 | 259,400 | 1.60 | 2.13 |
| 10 | 0.102 | 10,380 | 0.008155 | 800 | 400 | 0.029 | 0.403 | 0.735 | 0.838 | 0.559 | 0.372 | 163,100 | 2.55 | 3.39 |
| 12 | 0.081 | 6,530 | 0.005129 | 520 | 260 | 0.018 | 0.379 | 0.721 | 0.815 | 0.543 | 0.362 | 102,600 | 4.05 | 5.39 |

Young's modulus—20,000,000 inch-lb. units. Coefficient of linear expansion—0.0000072 per deg. fahr.



LONG SPANS ARE MADE POSSIBLE BY USING COPPER-CLAD STEEL. SHORTER TOWERS ARE ALSO PERMISSIBLE BECAUSE CONDUCTORS MAY BE STRUNG WITH LESS SAG

III. (See report of the overhead-systems committee of the N. E. L. A. for 1921.)

Although the use of the overhead ground wire is still a matter for debate among transmission engineers, it is felt that the advantage of its employment for protecting the transmission system would be greater if the conductors used for ground wires were less subject to corrosion and loss of strength, or to breakage under severe weather conditions. The "mechanical grade" of copper-clad steel wire can be used to good advantage for this service. This type has a conductivity 30 per cent less than that of copper, but is not subject to rust and has greater strength and longer life than galvanized wire.

In the support of telephone and signal cables, in carrying trolley feeders over streams and rights-of-way, and in general for carrying the weight of wires which require messengers, the copper-clad messenger strand

TABLE III—LOADING TABLES FOR BARE HARD-DRAWN COPPER-CLAD STEEL STRAND

Based on the requirements of the National Electrical Safety Code
(Compiled by the Copper-Clad Steel Company for copper-weld wire)

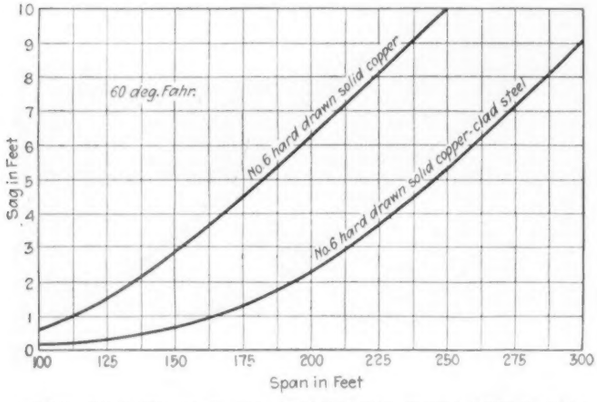
| Nominal Diam. (In.) | A.W.G. No. | Actual Diameter of Strand (In.) | Number of Wires and Size (A.W.G.) | Cross-Section | | Breaking Load* (Lb.) | Allowable Tension (Lb.) | Lb. per Linear Foot | | | Max. Load in Plane of Resultant—Lb. Linear Ft. | | | Young's Modulus | Modulus × Area | Ohms Resistance per 1,000 Ft. at 68 Deg. F. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Circ. mils | Sq. In. | | | Vertical | | Horizontal Wind Pressure, 8 Lb. Sq.Ft. | Heavy | Medium (⅔ Heavy) | Light† (⅔ Medium) | | | 40 per Cent Cond. | 30 per Cent Cond. |
| | | | | | | | | Dead Weight | Dead Plus ½ In. | | | | | | | | |
| ¼ | ..... | 0.612 | 7 No. 4 | 292,200 | 0.229 | 18,550 | 9,280 | 0.836 | 1.528 | 1.075 | 1.868 | 1.245 | 1.045 | 15,000,000 | 3,435,000 | 0.093 | 0.124 |
| 15/64 | ..... | 0.546 | 7 No. 5 | 231,700 | 0.182 | 15,400 | 7,700 | 0.663 | 1.304 | 1.031 | 1.662 | 1.108 | 0.829 | 16,000,000 | 2,912,000 | 0.118 | 0.160 |
| .. | 4/0 | 0.523 | 7 No. Sp. | 211,600 | 0.166 | 14,300 | 7,150 | 0.606 | 1.236 | 1.015 | 1.599 | 1.066 | 0.758 | 16,400,000 | 2,722,000 | 0.129 | 0.172 |
| ½ | ..... | 0.486 | 7 No. 6 | 183,700 | 0.144 | 12,600 | 6,300 | 0.526 | 1.139 | 0.991 | 1.510 | 1.007 | 0.671 | 17,000,000 | 2,448,000 | 0.148 | 0.197 |
| .. | 3/0 | 0.465 | 7 No. Sp. | 167,800 | 0.132 | 11,640 | 5,820 | 0.481 | 1.079 | 0.977 | 1.458 | 0.972 | 0.648 | 17,200,000 | 2,270,000 | 0.162 | 0.216 |
| 7/16 | ..... | 0.432 | 7 No. 7 | 145,700 | 0.114 | 10,160 | 5,080 | 0.418 | 0.998 | 0.955 | 1.381 | 0.921 | 0.614 | 17,800,000 | 2,029,000 | 0.186 | 0.248 |
| .. | 2/0 | 0.414 | 7 No. Sp. | 133,100 | 0.105 | 9,460 | 4,730 | 0.382 | 0.951 | 0.945 | 1.339 | 0.892 | 0.595 | 18,100,000 | 1,900,000 | 0.205 | 0.272 |
| ⅜ | ..... | 0.384 | 7 No. 8 | 115,600 | 0.0910 | 8,400 | 4,200 | 0.332 | 0.882 | 0.923 | 1.277 | 0.851 | 0.568 | 18,600,000 | 1,693,000 | 0.236 | 0.313 |
| .. | 1/0 | 0.368 | 7 No. Sp. | 105,500 | 9.0829 | 7,780 | 3,890 | 0.303 | 0.842 | 0.912 | 1.241 | 0.827 | 0.552 | 18,800,000 | 1,559,000 | 0.258 | 0.344 |
| 11/32 | ..... | 0.342 | 7 No. 9 | 91,630 | 0.0719 | 6,790 | 3,400 | 0.266 | 0.791 | 0.895 | 1.194 | 0.796 | 0.531 | 19,000,000 | 1,366,000 | 0.297 | 0.396 |
| 5/16 | ..... | 0.306 | 7 No. 10 | 72,660 | 0.0571 | 5,600 | 2,800 | 0.209 | 0.710 | 0.871 | 1.124 | 0.749 | 0.500 | 19,300,000 | 1,102,000 | 0.375 | 0.499 |
| 9/32 | ..... | 0.273 | 7 No. 11 | 57,640 | 0.0452 | 4,550 | 2,280 | 0.166 | 0.647 | 0.849 | 1.067 | 0.711 | 0.474 | 19,600,000 | 886,000 | 0.472 | 0.629 |
| ¼ | ..... | 0.243 | 7 No. 12 | 45,710 | 0.0360 | 3,640 | 1,820 | 0.129 | 0.591 | 0.829 | 1.018 | 0.679 | 0.452 | 19,800,000 | 713,000 | 0.597 | 0.793 |

Note: Sp. = special gage wire.
* Ultimate strength of strand is taken as 90 per cent of the sum of the breaking strengths of the individual wires, of the quality used in strand manufacture.
† Light loading is never less than 125 per cent of the dead weight.

has an advantage over galvanized-steel cable in that it is free from rust and deterioration. In railway tunnels or other places where corrosive gases are present this advantage is especially pronounced. Another use for such messengers is in the support of trolley wires in catenary construction. The higher conductivity of the copper-clad messenger permits its use as an auxiliary feeder.

### IMPROVES RELIABILITY OF RURAL SERVICE

The size of conductor for rural lines is frequently determined by considerations of safety from breakage due to wind and sleet loads rather than by conductivity. Thus, compared with solid copper wire, No. 6 copper-clad might frequently replace No. 6 hard-drawn copper with a saving of 30 per cent of the poles and insulators because of the use of longer spans, although strung with the same sag and possessing equal safety. Some saving in the cost of the conductor would also result because only 92 per cent as great a weight of wire would be used and the cost per pound would be less. Table V shows such a comparison of conductors, with




MUCH SMALLER SAGS ARE PERMISSIBLE WITH COPPER-CLAD STEEL WIRE

Curves of sag are based on ½-in. ice load and 8 lb. per square foot wind load.

the values given in the same form as those given in comparing copper and steel-cored aluminum in the article on "Rural Distribution" published in the *Electrical World* for Dec. 10, 1921.

As an example of a comparison based on regulation, consider a single-phase line 10 miles long operating at 4,600 volts, 60 cycles, and delivering a load of 20 kva. at 80 per cent power factor. Assuming the load to be concentrated at the far end of the line, the following tabulation would result for lines of No. 6 copper and copper-clad steel with 30 in. spacing between wires:

| | Copper | Copper-Clad Steel |
|---|---|---|
| Resistance per mile of wire, ohms | 2.09 | 5.25 |
| Reactance per mile of wire, ohms | 0.784 | 0.87 |
| $IR$ drop at 4.35 amp., volts | 182 | 456 |
| $IX$ drop at 4.35 amp., volts | 65 | 76 |
| Regulation, per cent | 4.01 | 8.93 |
| Per cent loss due to resistance | 4.94 | 12.4 |

The regulation and loss are not excessive for the copper-clad wire, and it is possible to use a 185-ft. span which would make an appreciable saving in first cost.

In high-tension distribution in city streets the necessity for safety makes possible the use of copper-clad steel conductors. In street-lighting circuits, for example, the current could be transmitted by a very small copper wire, yet safety requirements may force the use of No. 6 wire. Using a No. 8 copper-clad steel wire would give same mechanical strength, give satisfactory conductivity and permit installation at a material saving.

TABLE IV—CHARACTERISTICS OF SOME IMPORTANT CROSSINGS EMPLOYING COPPER-CLAD STEEL WIRES

| Crossing | Length of Span, Ft. | Difference in Tower Elevation, Ft. | Sag, Ft. | Size of Cable | Voltage, Kv. |
|---|---|---|---|---|---|
| Niagara River at Buffalo | 2,200 | None | 65 | 198,000 circ.mil (19-wire, No. 10 B.&S.) | 22 |
| Allegheny River at Colfax, Pa. | 1,785 | 382 | 151 | No. 4/0 (7-strand) | 22 |
| Ohio River at Vanport, Pa. | 2,130 | 220 | 110 | No. 4/0 | 22 |
| Connecticut River at Springfield, Mass. | 1,640 | ..... | ... | ⅜-in., stranded | 66 |
| Susquehanna River at Danville, Pa. | 1,700 | 426 | ... | ½-in. (19-wire) | 25 |
| Ohio River at Ambridge, Pa. | 1,650 | None | ... | ½-in. (7-wire) | 66 |

Other miscellaneous applications are in railway signal circuits, police and fire-alarm signal systems, trolley spans and fittings, tie wires and in overhead work for railroad electrification applications which are subject to corrosion from steam-locomotive gases.

The data in this paper refer particularly to the copper-clad steel wire made by the molten method. In this method, after the steel ingot has been brought to a welding temperature within a graphite mold, molten electrolytic copper is poured around the steel, and as the two metals cool a composite cylinder of copper firmly welded to the steel core results. Three general grades are produced—40 per cent conductivity, 30 per cent conductivity and mechanical grade. As suggested by the name, 40 per cent conductivity grade has 40 per cent the conductivity of pure copper of the same gage number. Mechanical grade has no guaranteed conductivity, but corresponds to a conductivity of about 25 per cent. An interesting development is a composite cable made of strands of pure copper and copper-clad steel wire. This makes a cable which has high conductivity and great strength which fills in the gap in conductivity between the 40 per cent copper-clad steel and copper.

The writer is indebted to the Copper Clad Steel Company of Rankin, Pa., for the opportunity to examine this process and resulting product and for certain data regarding its properties.

TABLE V—COMPARATIVE COSTS OF A MILE OF 2,300-VOLT, SINGLE-PHASE DISTRIBUTION LINE.

A. No. 6 copper, 125-ft. spans. B. No. 6 copper-clad steel, 185 ft. spans.

| | A—125-Ft. Span (Copper) | | B—185-Ft. Span (Copper-Clad Steel) | |
|---|---|---|---|---|
| Material | Quantity | Cost | Quantity | Cost |
| 30-ft. poles, Western cedar, butt-treated | 43 (6-in. top) | $387.00 | 29 (7-in. top) | $307.40 |
| Fir cross-arms with braces and pins | 45 | 56.25 | 31 | 38.75 |
| Lag screws | 45 | 1.35 | 31 | 0.93 |
| Through bolts | 43 | 4.73 | 29 | 3.19 |
| Double-end bolts | 2 | 0.30 | 2 | 0.30 |
| Anchor rods | 2 | 2.50 | 2 | 2.50 |
| Guy wire | 100 ft. | 1.20 | 100 ft. | 1.20 |
| Three-bolt clamps | 4 | 0.88 | 4 | 0.88 |
| Strain insulators | 2 | 1.10 | 2 | 1.10 |
| Porcelain insulators | 90 | 45.00 | 62 | 31.00 |
| Line conductors (T.B.W.P.) | 11,000 ft. | 201.00 | 11,000 ft. | 185.50 |
| Labor and Hauling: | | | | |
| Digging holes | | 41.00 | | 28.00 |
| Hauling, placing and setting poles | | 301.50 | | 209.50 |
| Guying | | 10.00 | | 10.00 |
| Stringing | | 104.50 | | 94.50 |
| Total, material and labor | | $1,158.31 | | $914.75 |
| 15 per cent overhead | | 173.74 | | 137.21 |
| Total | | $1,332.05 | | $1,051.96 |

# Storage Batteries Undergo a Severe Endurance Test

## Four Standard Makes of Batteries Subjected to 100,000 Jolts While Being Charged and Discharged Showed Negligible Depreciation

BY L. C. ILSLEY* AND H. B. BRUNOT†

AS PART of its work for the improvement of safety conditions in mines, the Bureau of Mines has undertaken to establish a list of permissible storage-battery locomotives for use in gaseous mines, and to this end has issued Schedule 15, "Procedure for Establishing a List of Permissible Storage-Battery Locomotives for Use in Gaseous Mines." Up to the present time two approvals‡ have been issued under this schedule, and considerable testing work done on four other applications which have been made for approval.

Prior to the publication of Schedule 15, the bureau conducted both field and laboratory investigations to determine the hazard from the batteries used in mine locomotives.‖ These investigations indicated that the safety of the locomotive would depend largely on proper care of the battery, also on the use of a battery as mechanically rugged as possible. For this reason the bureau staff, in testing locomotives submitted for approval, considered it advisable to subject the batteries to a jarring or bumping test to prove their adequacy as regards mechanical endurance and ruggedness. These tests on the batteries of the locomotives are described below.

### FOUR STANDARD MAKES TESTED

Battery cells manufactured by four of the leading storage-battery companies have been tested. The sizes, types and approximate weights and dimensions of the batteries used in the tests are given in the table.

All the jars of the lead-acid type cells had a wall thickness of $\frac{1}{8}$ in. or over, and the rubber compounds used in their construction had been made under one or the other of the two following specifications for physical properties, namely:

1. Normal tensile strength, 5,000 lb. per square inch. Elongation, 6 per cent. Tolerance: Tensile strength, 4 000 lb. per square inch, elongation 7½ per cent; tensile strength, 6,000 lb. per square inch, elongation 5 per cent. For intermediate values product of figures for tensile strength and per cent elongation not to be less than 30,000.
2. Nominal tensile strength, 3,000 lb. per square inch. Elongation, 5 per cent. Tolerance: Tensile strength, 3,600 lb. per square inch, elongation 3 per cent; tensile strength, 3,300 lb. per square inch, elongation, 4 per cent; tensile strength, 3,000 lb. per square inch, elongation, 5 per cent; tensile strength, 2,700 lb. per square inch, elongation, 6 per cent.

### CHARGED AND DISCHARGED WHILE UNDERGOING 100,000 JOLTS

The tests consisted in jarring or bumping the cells, as assembled in their trays, 100,000 times, by dropping them vertically on a timber framework or foundation from a height of about 2 in., at a rate of forty to sixty times per minute. While this test represented only one type of jolt which might result from actual service, and that in an approximate and possibly exaggerated manner, it probably was sufficient to reveal any undue mechanical weakness or lack of endurance in the battery cell.

Except for the first make of cells tested, which were open-circuited during the entire jolting period, all of the cells were charged and discharged during the greater part of the test. Recording instruments were connected in circuit to give a continuous record of conditions. Upon the completion of the 100,000 jolts, each tray of cells was put through one or more cycles of charge and discharge to determine whether or not the test had caused any noticeable loss of capacity, after which one or more of the cells were disassembled for inspection. Neither the record of the recording voltmeter nor current measurements made during charge and discharge gave any indication that any of the cells had been damaged by the jolting, and as far as was discovered by electrical measurement no internal injury had been done to the cells.

*Electrical engineer Bureau of Mines.

†Junior electrical engineer Bureau of Mines.

‡Approval No. 1500, issued to the George D. Whitcomb Company, Rochelle, Ill.; approval No. 1501, issued to the Jeffrey Manufacturing Company, Columbus, Ohio.

‖L. C. Ilsley and H. B. Brunot, "Preliminary Investigations of Storage-Battery Locomotives," Technical Paper No. 264, Bureau of Mines, 1921.

MAKES, TYPES AND APPROXIMATE SIZES, WEIGHTS, ETC., OF BATTERIES TESTED

| Manufacturer | Electric Storage Battery Company | | Philadelphia Storage Battery Company | | Gould Storage Battery Company | Edison Storage Battery Company |
|---|---|---|---|---|---|---|
| | "Iron-Clad" MV 17-Plate | "Exide" MV 9-Plate | WML 11-Plate | WMLX 11-Plate | L 149, 29-Plate | G-14 |
| Discharge rate, amp. | 56 (4½ hr.) | 28 (4½ hr.) | 30 (5 hr.) | 30 (5 hr.) | 78½ (5 hr.) | 70 (5 hr.) |
| Size of plates: | | | | | | |
| Width, in. | 5⅞ | 5⅛ | 5⅞ | 5⅞ | 5⅞ | 4⅞ |
| Height, in. | 8⅞ | 8⅛ | 8⅞ | 8⅞ | 8⅞ | 9¼ |
| Outside dimensions of container: | | | | | | |
| Length, in. | 6⅛ | 3⅛ | 3 5/16 | 3 5/16 | 9⅛ | 6 |
| Width, in. | 6⅛ | 6⅛ | 6 5/16 | 6 5/16 | 6⅛ | 5⅛ |
| Height, in. | 12⅛ | 12⅛ | 13 1/16 | 13 1/16 | 13⅛ | 12⅛ |
| Sediment space, distance bottom of plates to bottom of cell, in. | 1½ | 1½ | 2½ | 2½ | 2½ | ½ |
| Over-all height of cell, bottom of container to top of terminal, in. | 13½ | 13½ | 14½ | 14½ | 15½ | 13½ |
| Weight in pounds: | | | | | | |
| Element | 44 | 22 | 24 | 24 | 69 | 23 |
| Electrolyte | 7½ | 4½ | 6 | 6 | 14 | 8 |
| *Complete cell | 57 | 30 | 32½ | 32½ | 90 | 34 |
| Number of cells per tray | 4* | 4 | 2 | 2 | 2 | 4 |
| Weight of tray and cells, lb. | 265* | 148 | 75 | 75 | 203 | 147 |
| Number of spacers per tray | 3 | 0 | 0 | 0 | ... | 1 |

* The two end cells were removed from the tray in the tests to lighten the load on the testing machine. The weight with the two cells removed was, therefore, about 150 lb.

Examination of the disassembled cell showed (1) that the container of one of the cells had a small crack which gave rise to a slow leak, (2) that in another cell one plate had broken away from its connection with the rest of the element, (3) that the plates in four of the cells had been grooved by the bottom support, and (4) that several of the plates in two of these cells were cracked or broken at these points. It is not clear that the crack in the container of one cell and the breaking away of one plate in another cell were entirely caused by the jolting, as a cell from the same lot which had not been jolted was found to have a similar leak, and examination of the broken plate indicated that it may have been defective to start with. The four cells in which the bottom of the plates were injured became loose in their trays during the test and were therefore probably subjected to a more severe jolting than they would have been otherwise. This is borne out by the fact that the cells which became loose first were injured to the greatest extent. Moreover, observation of the testing machine showed clearly that the weight of cells being tested had a marked effect on its action and therefore on the severity of the resulting jolts given the cells.

As was to be expected, all of the cells spilled more or less electrolyte during the test, although with some of the cells the spillage was remarkably small.

One intertray and one intercell connector were broken by the tests. The first breakage was the result of the threshing about of a heavy brass terminal with which the connector was equipped, and the second resulted from the excessive movement of the cells that came loose in their tray.

The tests indicate that the battery cells at present supplied for mine locomotives have sufficient mechanical endurance to withstand the ordinary jolts they are likely to receive in service. However, the damage to the bottom of the plates and to the intercell connector of the cells, which became loose in the trays, points to the advisability of having the cells tight in the tray to avoid unnecessary movement with the resulting wear on the cell.

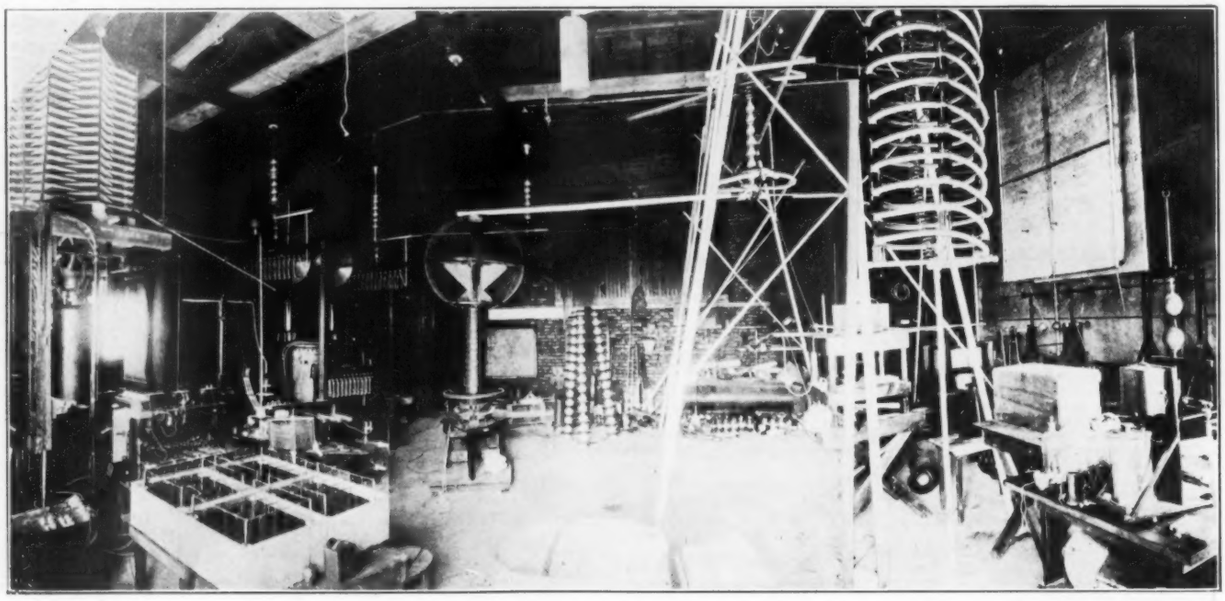
From the results of the tests it would appear probable that no great hazard will result from the use of properly installed and cared-for batteries in permissible locomotives.

## Localized Radio Landing Signals for Airplanes

SEVERAL years ago the Bureau of Standards at Washington was called upon to develop a method to assist airplanes in accurately locating the landing field when the airplane was quite close at hand. A method was desired that would give a signal heard over a comparatively large area when the airplane was at a high altitude but which would be localized within a small area when the plane was near the ground. A method employing a large horizontal coil tuned to 500 cycles was tried but did not prove satisfactory. The use of radio-frequency waves was therefore undertaken, and two horizontal coils, one above the other, with current flowing in opposite directions, were used. A fairly high radio frequency, such as 300 kilocycles, was employed in this case.

A calculation was made which indicated that the signals radiated from the two coils would be the strongest for an airplane flying in a given horizontal plane whenever the airplane was within a comparatively small ring-shaped area above the landing field. The results of these calculations were verified in practice. The bureau has published a paper giving the theory of the radiation from an antenna consisting of two horizontal coils such as that described above, No. 431, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents per copy.

## The University Laboratory a Place for Co-operative Research



Through the proper type of co-operation and co-ordination university laboratories can become a medium through which more investigation can be conducted that will be of value to electrical industry as a whole. This is the laboratory at Leland Stanford, Jr., where Professor Ryan has conducted many investigations on high-voltage insulators which have been of inestimable value to manufacturer and electric service companies. More research of this caliber is needed.

# Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

## Going Value and the Galveston Case

*To the Editors of the Electrical World:*

Your editorial in the issue of the *Electrical World* of May 6 on the Federal Supreme Court's decision in the Galveston case is appropriate and timely. This whole matter deserves some prompt consideration and action on the part of the utilities. You point out some consolation in the fact that the court appears to reject development costs only and that the opinion should not be interpreted as a rejection of going value. The fact that these two are confused and that this opinion is capable of being interpreted as a rejection of going value is entirely the fault of the appraisal engineers.

The bottom of the trouble is that the valuation engineers, as well as some commissions, in attempting to find a yardstick for measuring going value have forgotten the original idea of going value and have substituted the gage for measurement for the thing itself. The result is that so many people have used early losses or development costs as the estimate of going value that they have forgotten that going value means anything else than such development costs. Development costs are real and tangible costs and should be included in the list of actual and proper expenditures, whereas going-concern value is entirely intangible and is in no way related to early losses or development costs. To understand this one should refer back to the early keynote decisions of the Supreme Court. On the basis of that court's statements, commissions were very reluctant to make a separate finding for going value, and usually set out the total "fair value" in round figures, "taking into account the fact that the plant was in successful operation."

This method was a great handicap to the companies in a court review, and so much emphasis has been placed on the methods of *estimating* going value that these theories have come to be regarded as the thing itself; hence the very confusing decision in the Galveston case.

The valuation engineers should get back to first principles and present the theory of going concern value, not as some actual and necessary expenditure for non-physical property, but as the value which accrues to the actual costs because of certain favorable conditions. Just what conditions and circumstances should be considered were very ably enumerated in the report of the special committee of the American Society of Civil Engineers, which submitted its report under date of Oct. 28, 1918. On pages 1917 to 1921 inclusive, the report sets out certain intangible items of value which may enter into the value of a going concern and which are not necessarily represented in the original cost figures. Some of these are as follows:

1. The fact that the system is in successful operation with an established business.
2. Present worth of estimated earnings including those of future business growth.
3. Favorable or "strategic" location.
4. Exceptional efficiency in design, construction or management.
5. Traffic and operating agreements.

None of the above items consider early losses or development cost. In fact, the report treats development cost separately and among the items of actual expenditure. If we will consider these ideas, the Galveston decision, while rather indefinite, is still capable of a reasonable interpretation, and the valuation engineers could not do better than to adopt the report of the above-mentioned committee and apply each of the principles outlined to each individual case and thereby determine the true going-concern value in each instance.

J. A. WHITLOW.
Arkansas Light & Power Company,
Pine Bluff, Ark.

## Tests for Sludging of Oil Being Investigated

*To the Editors of the Electrical World:*

In an article by C. J. Rodman in the July 1 number of the *Electrical World*, which discusses desirable qualities of transformer and switch oils, reference is made to work being done on the development of methods of testing these oils.

The committee on electrical insulating materials of the American Society for Testing Materials has been working on this problem of testing transformer oils, among others, for some time. Of several methods which have been tentatively adopted by the society one deals with insulating oils and is entitled: "Tentative Methods of Testing Transformer and Switch Oils."

It will be noted that one of the most important tests for transformer oil, namely, the so-called sludging test, is omitted. A satisfactory test procedure had not been agreed upon at the time this tentative standard was issued—about a year ago—but it was confidently expected at that time that the extensive co-operative research work which was being started would give us the desired information very promptly.

Unfortunately, our optimistic predictions have not been fulfilled. It has been found that apparently variations in some of the minutest details of the various methods which were being considered have a marked influence on the result. Furthermore, the various methods give widely different results, so that an oil which would be considered high grade from a sludging standpoint by one method would be classed as decidedly inferior by another method.

However, the problem is being vigorously attacked by a very competent committee, under the chairmanship of F. R. Baxter of the Vacuum Oil Company, which, after studying four different methods and finally agreeing upon the smallest details of procedure, is having analyses made of several samples of oil in each of about six different laboratories—all laboratories having specimens of exactly the same samples and all following exactly the same procedure in each of the four methods. The four methods being investigated are tentatively described as follows: Deposit test (formalite test), iodine or bromide value, sludging test (modified Michie procedure), tar test.

It is expected that the results of this co-operative work will show just what can be done and what cannot be done in the way of setting up a satisfactory standard test for so-called sludging of transformer and switch oils.

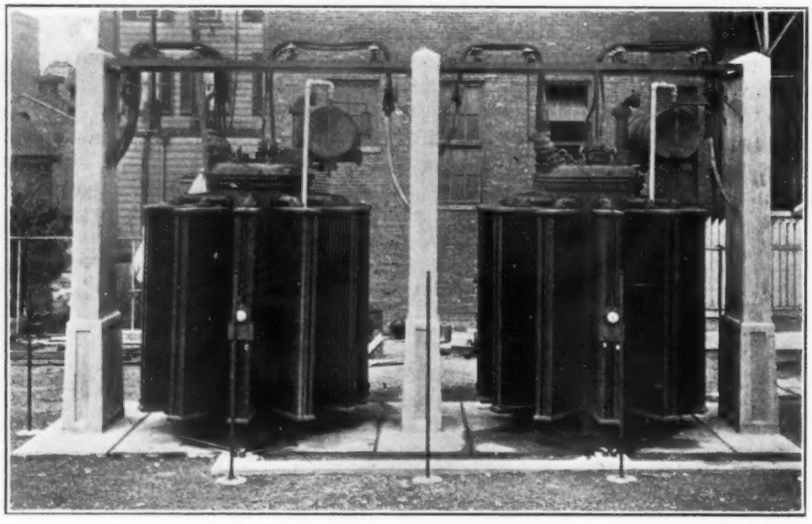
F. M. FARMER,
Chairman A. S. T. M. Committee D-9
New York. on Electrical Insulating Materials.

# Industrial and Station Practice

Installation, Operation, Test and Repair of
Generating and Distribution Equipment and Methods of Economically Utilizing
Electrical Energy in Mills and Factories

## Concrete Columns Inclose Connections with Underground Circuits

A RATHER difficult problem of an outdoor tranformer installation was solved by the New York & Queens Electric Light & Power Company as shown in the accompanying illustration. The transformers are installed at the Hamilton Street substation in Long Island City, and the plans provide for an ultimate installation of ten 7,500-kva., three-phase, 60-cycle, 13,200-volt delta to 2,300/4,000-volt Y transformers. The buses and switching equipment are inside the substation building, and the arrangement of the property is such that the transformers must be installed at the rear or short end of the building. Direct overhead connection to the transformers was therefore impossible, and instead both primary and secondary connections were made underground through 4-in. fiber ducts.



MINIMUM AMOUNT OF EXPOSED WIRING PRODUCES A NEAT APPEARANCE

The primary leads are three-conductor 450,000-circ.mil cable, and each secondary lead consists of two 800,000-circ.mil single-conductor cables run in one conduit. All cables are lead-incased. Because of the large number of conduits in the ultimate installation (ten for primary cables and thirty for secondary) it was found necessary to place the transformers 25 ft. from the building to allow large radius bends.

These conduits are carried up through concrete columns between the transformers, the primary for one transformer and the secondary for the adjacent transformer being inclosed in the same column. The conduits are turned at the top and brought out through the side of the column, at which point the potheads are installed. A light steel structure supported between columns carries the leads to the transformer bushings. Tanks and a pump are provided for removal of oil from the transformers.

The transformers and columns are placed on independent concrete foundations with joints of plastic material between them to avoid the possible shearing off of the conduits entering the column in the event of any settlement of the transformer foundation, and the conduits are so arranged that they do not pass under the transformer foundation. This arrangement presents a very neat appearance, and the small amount of exposed wiring makes it extremely safe.

W. C. BLACKWOOD,
Electric Engineer.
New York & Queens Electric Light & Power Company.

## Feed Water Treated at a Cost of 9.8 Cents per 1,000 Gal.

IN THE treatment of boiler water there is no remedy that will overcome all the troubles encountered, but there are in use methods which aid in its purification. These methods include the use of boiler compounds, the continuous-treating process, the intermittent treating process, the use of artificial or natural zeolite, and evaporation.

Boiler compounds are usually composed of a gelatinous substance, tannic acid, soda ash and maybe one or more salts. This method of treating boiler water was the first method used in boiler plants. The compound is either introduced before the water goes to the heater or afterward as it is going to the boilers, or, as in some cases, it is introduced directly into the boilers. If the compound is introduced before the water enters the heater, there is a possible chance for certain reactions in the heater and purer water enters the feed-water system. The plan will, however, necessitate blowing down the heater oftener as well as speeding up the cleaning periods. When the compound is introduced after the water has come from the heater, the reaction takes place in the boilers, and it is necessary after a certain concentration to blow down the boilers.

The continuous-treating process is the method usually found in plants where jet or barometric condensers are in use. For this process it is necessary to have a feed-water heater, a sludge or settling tank, two or more filters and a chemical feeding device. This system of treatment was installed in the Water Street station of the Toledo Edison Company in 1917. Although certain troubles and difficulties developed at the start, it is still in service and doing good work. At the present time this plant is treating 1,000 gal. of water for 9.8 cents.

The intermittent process requires two or more sedimentation or settling tanks with agitators, two or

more filters and a means of mixing and pumping chemicals to the water in settling tanks. With this method, as in the continuous-process method, the water is treated with lime, soda ash and iron sulphate, with caustic soda or whatever the analysis of the raw water may show to be required for the treating.

This is the process that is in use at the Acme station of the Toledo Edison Company, and it has a capacity of 12,500 gal. per hour. The cost is 14.1 cents per 1,000 gal. of water treated. The analysis of the water from the Maumee River is given in the accompanying table. With this method of treatment the hardness of the make-up water has been reduced by 15.5 grains per United States gallon. The difference between the condensate returns and condensed steam off the header is due to a condenser leakage which amounts to 0.43 per cent.

ANALYSIS OF THE BOILER-FEED WATER TREATED BY INTERMITTENT PROCESS

| Place from Which Sample of Water Was Taken | Grains per U. S. Gallon | | | |
|---|---|---|---|---|
| | Salt | Alkalinity | Causticity | Hardness |
| Raw-river water | 1.6 | 9.4 | 0.0 | 17.0 |
| Treated water | 1.8 | 4.5 | 3.0 | 1.5 |
| Condensate from condensers | 0.3 | 0.25 | 0.1 | 0.5 |
| Water from heaters | 0.3 | 0.5 | 0.1 | 0.6 |
| Steam from headed | 0.2 | 0.2 | 0.0 | 0.2 |

The fourth method of feed-water treatment is comparatively new. It takes its name, the zeolite method, from a mineral ore. The name applies to certain bases which make up the silica-alumina structure. In using this system the water is passed through filter-like beds of zeolite, which exchange their bases and make the water virtually pure. This process continues till the zeolite has spent itself; then the beds are regenerated by a treatment of a concentrated brine solution. This method appears to be the best devised, but, like the others, it has its drawbacks. For instance, it is impossible to use this method with acidic water as the acid destroys the zeolites.

The fifth method of water treatment is by the use of evaporators which evaporate the water and afterward condense it. This method looks like a panacea for feed-water ills, but it too has its drawbacks. One of the chief ailments is that with certain waters the evaporators themselves prime, causing as much trouble as if the water were used directly in the boilers, if not more.

C. E. LEWIS.
Toledo Edison Company,
Toledo, Ohio.

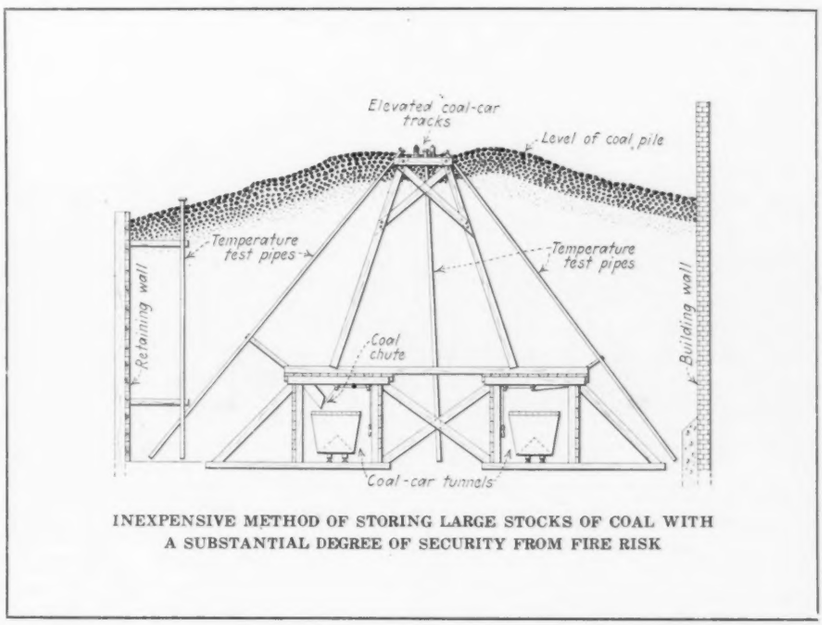
## Storing Bituminous Coal to Depth of 40 Ft.

LARGE reserve stocks of coal must be stored by central station companies in emergencies like the present coal strike, and where space is limited the normal maximum depth of 8 ft. to 10 ft. in the pile sometimes has to be exceeded by several hundred per cent. To overcome the danger of spontaneous combustion from overheating, the Rockingham County Light & Power Company of Portsmouth, N. H., has installed a series of test pipes in the pocket at the Daniel Street generating station, as shown in the accompanying illustration. These pipes are used as runways for thermometers lowered and raised by strong cords marked at regular intervals by knots which enable the depth at which readings are taken to be noted, and by reference to an appropriate drawing the behavior of the coal in any section of the pile can thus be studied.

When a new cargo of coal is placed in the pocket, tests of the temperature are made daily in each pipe until the exact conditions in all parts of the pile are determined. The pipes are 2 in. in diameter and are placed at frequent intervals and permanently clamped into position. The tunnels from which the coal is drawn for station use are numbered, and chutes 5 ft. apart are installed. If any spot shows signs of overheating, coal is drawn from the nearest chute until the hot spot is removed. The thermometers are inclosed in wooden frames to prevent breakage.

The arrangement was inexpensive to install and has permitted the storage of large stocks of coal to a maximum depth of 40 ft. with a very substantial degree of security from fire risk. The pocket installation was designed by W. H. Allen of the company's engineering department and has given excellent service.

FRANK W. RANDALL,
Assistant to General Manager,
Rockingham County Light & Power Co.
Portsmouth, N. H.




INEXPENSIVE METHOD OF STORING LARGE STOCKS OF COAL WITH A SUBSTANTIAL DEGREE OF SECURITY FROM FIRE RISK

## Automatically Regulated Motor Field

BY PLACING one turn of the negative lead of a direct-current generator on each of two field poles of the exciter provided for exciting the synchronous motor driving the generator the set was enabled to carry overload as high as 200 per cent without hand regulation.

The set consisted of a 750-kw., 1,200-volt direct-current generator driven by a synchronous motor. Because of the heavy overloads it was formerly required to use close hand regulation to maintain the exciter voltage. The extra single turns were placed on two poles of the 18-kw. non-interpole exciter and connected in series with the negative lead of the generator. With the extra winding at no load the exciter operates at 85 volts and with 150 per cent load increases to 129 volts. The cost of the job was $80, which included a voltmeter for the exciter

FIELD EDITOR ELECTRICAL WORLD.
San Francisco, Cal.

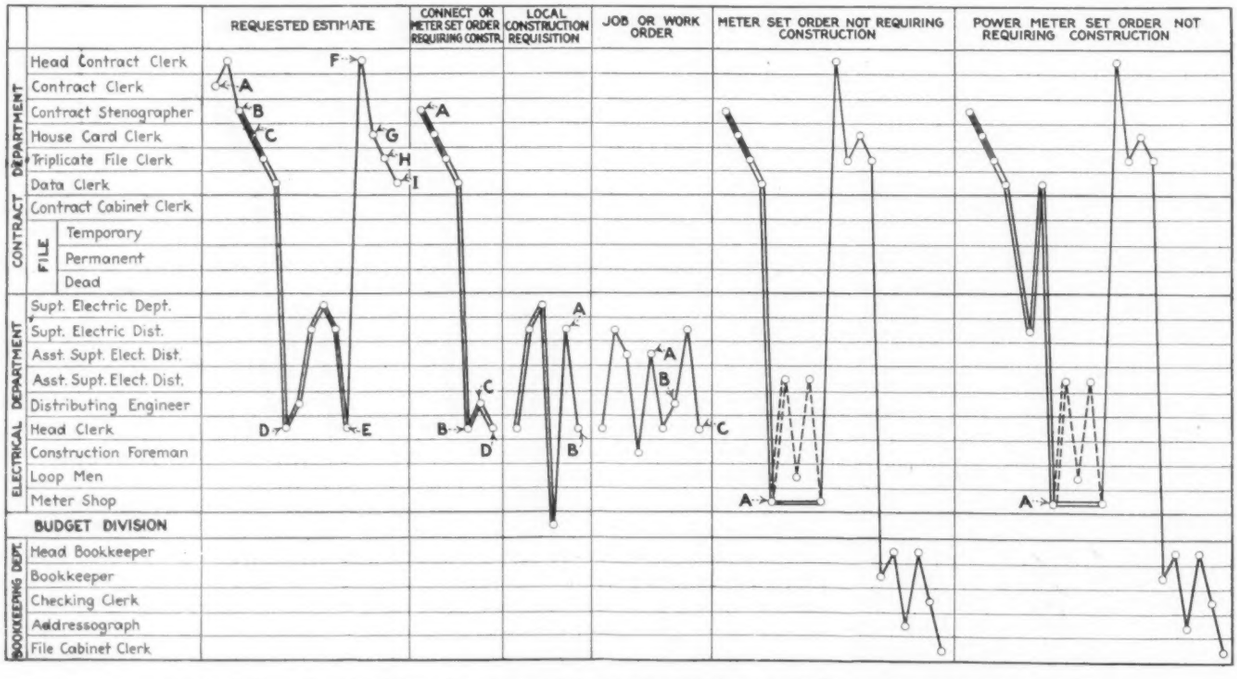
## Motion Study Reduces Handling of Distribution Orders

A CAREFUL study of the routine handling of estimates and orders in connection with the electrical distribution of the Denver (Col.) Gas & Electric Light Company considerably reduced expense, largely eliminated the possibilities of errors and of delayed orders and simplified the work.

This study was made easy by using a chart similar to the one reproduced herewith. By studying this unnecessary handlings were seen and eliminated from the system. Then a guide chart of the same kind was drawn for directing the movements along the lines found best. The chart shown is this perfected guide chart. On it is shown the course of each order from one employee to the next and the number of copies which are handed on. For example, a requested estimate, known in that company as a "can-we-light," goes first to a contract clerk, who makes a memorandum and sends it to the head contract clerk. This man "O. K.'s" it and sends it to the contract stenographer, who fills out a regular "request for estimate" form in triplicate. This form passes through the hands of the house card clerk to the triplicate file clerk, who detaches and files one copy and sends the other two to the data clerk. He puts on the essential data and forwards it to the head clerk in the electrical department for recording. It then goes to the distribution engineer for making his estimates and then to the superintendent of electric distribution and the superintendent of the electric department for approval and back to the head clerk, who files one copy. The remaining copy is returned to the contract department, where the head contract clerk informs the applicant of the cost. Later this copy goes to the card clerk, the triplicate file clerk, and finally to the data clerk, where it is held until the contract is signed. The estimate accompanied by the contract is then sent to a stenographer, and the regular "connect" or meter order is made. The routine handling of the successive forms is shown in the chart, which is posted in the various departments for reference.

R. A. HAMMOCK,
Superintendent of Distribution.
Denver Gas & Electric Light Company,
Denver, Col.

| Curve | Particular Duty Done at Each Point |
|---|---|
| | REQUEST ESTIMATE |
| A | Memorandum |
| B | Request made in triplicate |
| C | For entry |
| D | To be recorded |
| E | For filing engineer's copy |
| F | Applicant informed as to cost |
| G | For additional entry |
| H | For pulling of triplicate copy |
| I | Held for signing of contract; then accompanies contract to C, where connect order is made out |
| | "CONNECT" OR "METER SET" ORDER |
| A | Estimate detached and accompanies order |
| B | Recorded and engineer's copy of estimate attached |
| C | Rough draft of local requisition and job order made. If less than $200, a work order only is made |
| D | Order typewritten and estimate detached and filed; both copies of "connect" order accompany work order |
| | LOCAL CONSTRUCTION REQUISITION |
| A | If authorized work order is sent forward for execution, then held until all charges are in |
| B | For permanent file |
| | JOB OR WORK ORDER |
| A | For setting meter |
| B | For entries on maps |
| C | For filing |
| | "METER SET" ORDER NOT REQUIRING CONSTRUCTION, OR POWER METER SET ORDER NOT REQUIRING CONSTRUCTION |
| A | If requiring a service loop, a memorandum order in duplicate is forwarded to the assistant superintendent in charge of loops for execution. |




A CLEAR CHARTED INDICATION OF ROUTINE ELIMINATES ERRORS IN HANDLING DISTRIBUTION ORDERS
The table above the chart specifies the special duties of various employees as each order passes through their hands.

## Increasing Air Gap Corrects Starting Troubles

NOT infrequently it happens that trouble develops in electrical equipment for which a ready remedy cannot be found in the experience of the repair man or in the literature of the industry. Such a problem presented itself some time ago in starting a standard-make 75-kw. direct-current, 112-hp., three-phase, 25-cycle, 440-volt motor-generator unit.

In the starting position, with the half-voltage tap on the compensator, the motor took about 600 amp. or five times full load current. It barely turned over and chattered violently. The unit was of the two bearing pedestal type with the base firmly grouted in. The alignment of the stator frame was adjusted by means of shims to secure an even air gap when the machine was at rest. When

the unit was started the rotor apparently attempted to cling to the top of the stator and rubbed against the stator iron. It was thought that the current distribution in the winding, which was a two-path star connection, might not be equalized. An ammeter in each circuit and an equalizing connection between pole-phase groups eliminated this possibility. Evidently it was essential to eliminate all vertical movement of the rotating element in the bearings that was possible, prevent any possible shifting of the stator frame and to investigate possible vibration of the shaft of the unit. After concluding this investigation and slightly increasing the air gap at the top of stator as compared with the bottom the starting performance was slightly improved. However, the machine would not come up to speed on starting and took about four times full load current on the starting position.

After consulting the manufacturers with regard to increasing the air gap it was found that this could be increased 0.012 in. without seriously affecting the performance of the motor. A cut of 0.012 in. was taken off the rotor iron in a lathe and the machine reassembled. The machine then quickly came up to speed on the lowest tap of the compensator with a maximum starting current under two times full load current and showed normal performance as to heating at full load.

### SILVER SOLDER WITHSTANDS SEVERE STARTING CONDITIONS

While the rotating element was out of the machine some of the rotor bars were found to have loosened up due to the strain imposed by the severe starting conditions. These bars were silver soldered before the rotor was replaced. It is practically useless to use ordinary solder on rotors, as any severe overload will cause the rotor bars to heat and throw out the ordinary solder. It is comparatively easy to silver-solder rotor bars if the copper section is large enough to prevent melting the copper under the oxyacetylene flame. There is one point to observe and that is to have the copper absolutely clean before soldering. In this case the cleaning was accomplished by suspending the rotor by means of a crane over a small tank of a chemical cleaning compound which was kept boiling by means of a gas heater. The rotor was revolved in this cleaner and all dirt, grease and foreign matter was quickly removed, after which the rotor was silver-soldered.

J. E. HOUSLEY,*
Aluminum Company of America.
Kansas City, Mo.

*Formerly assistant power superintendent of the Aluminum Ore Company, East St. Louis, Ill.

## Reduce Coal-Handling Time by Conveyor System

THE rate at which coal cars can be emptied by a monorail type of conveyor is shown in the accompanying table. This information was derived from a contest held by the Godfrey Conveyor Company in which records were sent in from coal dealers and industrial plants using the type of equipment shown in the illustration.

CAR WITH 50 TONS OF COAL UNLOADED BY THIS CONVEYOR IN ONE HOUR AND EIGHTEEN MINUTES

In each case submitted one man dumped the car, filled the bucket, operated the hoist and closed the dumps on the car. The coal bucket was lowered to the pile before emptying and not dumped from the raised position of the bucket. The majority of the results shown were achieved by coal dealers who at the time of year when the record was made had occasion to unload several cars of coal daily to meet the fall and winter demands of the retail business. The speed that these dealers have made is significant owing to the fact that the average coal yard does not maintain a man with technical knowledge to operate the conveyor. During the limited time the contest was conducted there was probably an insufficient amount of coal handled by industrial plants to warrant many taking part. Still better results could doubtless be made by these plants were there a thorough understanding of the mechanical equipment by the operatives.

The records made showed that with one man operating the equipment the average power and labor cost was from 5 cents to 7 cents per ton. Remembering that it costs 30 cents to 50 cents per ton to unload coal by hand, it will be seen that a large saving can be made by the use of a conveyor.

M. M. MUMMERT.
Godfrey Conveyor Company,
Elkhart, Ind.

RECORD FOR UNLOADING COAL CARS BY COAL DEALERS AND INDUSTRIAL PLANTS

| Contest Rating | Weight of Coal, Lb. | Kind of Coal | Average Size of Lumps | Distance Conveyed, Ft. | Distance Bucket Raised, Ft. | Unloading Time |
|---|---|---|---|---|---|---|
| 1 | 96,600 | 2-in. lump | 2 in. x 6 in. | 87 | 30 | 1 hr. 18 min. |
| 2 | 94,200 | 6-in. lump | 6 in. | 150 | 30 | 1 hr. 40 min. |
| 3 | 103,000 | Egg | 3 in. x 6 in. | 50 | 50 | 1 hr. 30 min. |
| 4 | 96,800 | 6-in. lump | 6 in. | 32 | 56 | 1 hr. 32 min. |
| 5 | 96,600 | Illinois | 3-in. x 6-in. egg | 40 | 40 | 1 hr. 28 min. |
| 6 | 93,600 | 6-in. lump | 9-in. | 110 | 52 | 2 hr. 57 min. |
| 7 | 133,400 | Franklin County | 3-in. x 6-in. | 70 | 40 | 3 hr. 15 min. |
| 8 | 89,740 | Anthracite stove | 1⅞-in. screen | 20 | 40 | 1 hr. 40 min. |

# Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

## The Fly in the Ointment

### Costs of Raw Material and of Labor as Seen by a Public Utility Purchasing Agent

By L. C. Haskell
Secretary-Treasurer and Purchasing Agent
Southern Canada Power Company, Montreal, Que.

PURCHASING for public utilities is in a class by itself. The purchasing agent of an industrial corporation knows that whatever he has to pay for his purchases will be absorbed in the price asked for the manufactured product of his company and will be passed on to the ultimate consumer. Not so with the purchasing agent of the public utility corporation. He knows that the price of the product of his company —service to the public—is fixed by franchises or public service commissions, and therefore any increase in the cost of his purchases goes directly to the reduction of net earnings through increased cost of operation and maintenance.

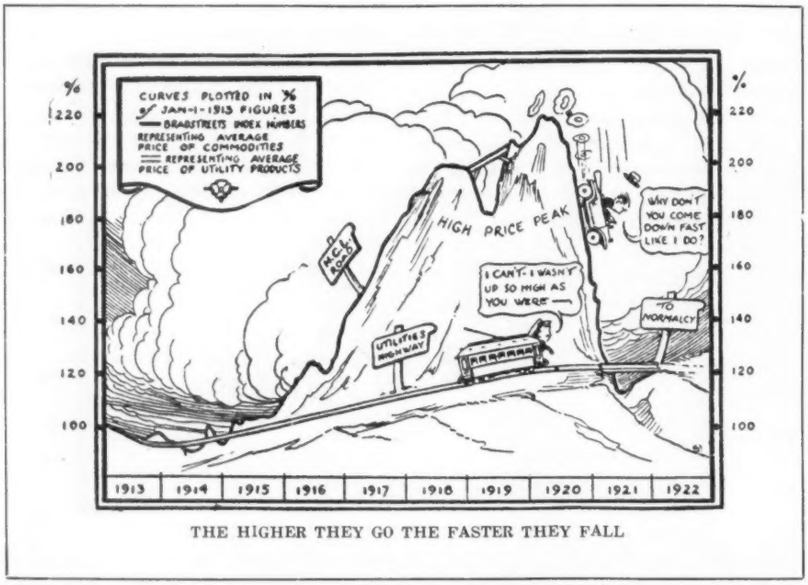
It is interesting to note the different arguments put forth by salesmen in their attempts at justification of continued high prices of some lines of commodities used by public utilities. During the war, when the prices of copper, steel, aluminum, rubber, oil, cotton and other raw materials as well as of labor were abnormally inflated, salesmen justified their quotations on electrical machinery and other manufactured electrical supplies by the assertion that the predominating element was copper.

When the price of copper declined after the cessation of hostilities in Europe, the sellers of public utility requirements were wont to say that the drop in copper made very little difference in their costs, as steel and labor, not copper, were the controlling factors in the cost of electrical supplies. The prices of steel, lead, cotton and practically every item of raw material entering into the price of manufactured supplies used by public utilities have approached the June, 1914, level, and rubber, aluminum and copper are far below that level. Indeed, 17-cent rubber to-day as compared with 70-cent rubber in June, 1914, makes one wonder if the millennium is not near at hand.

Now the salesman, eager to justify his prices, pins the blame on labor. "You know," he says, "our firm has not reduced wages," or "Our firm has reduced the wages of our employees only 20 per cent, which is a mere bagatelle when compared with the inflation of wages over those of 1914," or "Really, you know, the raw materials make up a small part of our product—labor is the big item."

It is true, and no one knows it better than the public utility purchasing agent, that the iniquitous schedule of wages and salaries foisted, for political purposes, on the railways and the public under the cover of "a war necessity" has been and continues to be "the fly in the ointment." Granted, however, that wages in those industries affected by the "railway schedule" are still inflated—and most industries are affected directly or through high freight rates—yet one item is still being overlooked by the manufacturers, and that is the increased efficiency of labor. A recent report of one of the largest tire manufacturers makes very pleasant reading where it says that to-day 24,000 tires are turned out daily with 10,000 men, whereas in 1919 it took 33,000 men to manufacture 31,000 tires; that is, one man is to-day turning out two and one-half times the work he did in those rollicking days when almost everything, including inflated prices, could be passed on to the long-suffering public. If the tire industry can bring about such an increase in efficiency, cannot the same thing be done in the manufacture of such machinery and supplies as enter into the development of the country's resources and the operation of such resources by public utility corporations?

The public utility corporation is one of the biggest factors in the development of any country. It is, as its name implies, the servant of the public and as such deserves and must get its sinews of life and growth upon such a basis as will enable it to keep pace with the demands and ambitions of the public it serves.




THE HIGHER THEY GO THE FASTER THEY FALL

This article was written in Canada, yet so close are the trade relations of Canada and the United States and so nearly identical are the economic conditions of the two countries that it might well have been written in New York.

## Better Business Developed by Sales Contest

FIELD Day on the Boston Edison system was utilized as an opportunity to call the attention of every one of the company's 2,325 employees to an appliance sales con-

HERE'S YOUR CHANCE TO GET
Useful Electrical Appliances-Free!
Boost Our Company's Business and Increase the Enjoyment of Edison Service by Our Customers.
An Electric Toaster Prize Selling Contest!
Every Edison Employe will be in on this. Everyone has a Chance and a Free Field. For every one has Friends among our Customers.
The Toaster for the sale is the Nationally known Edison Toastmaster, regular price $8.00, but for this Contest it is priced at $6.50. In addition, a full-nickeled Serving Rack will be given with each Toaster. If the customer wishes, the terms will be $2.50 down and $2. a month for two months.
Let's All Hustle for These Prizes:
6 Toasters, - - - - - One Toaster
12 " - - Domestic Flat-Iron or Two Toasters
18 " - - Thomas Percolator, Flat-Iron and Toaster, or 3 Toasters
24 " - - Thomas Grill, Percolator, Flat-Iron and Toaster, or 4 Toasters
Special Prizes for All Who Sell More Than 24 Toasters.
If every one of us (2325 Employes) sells 10 Toasters, the added business will equal the capacity of One Big Turbine!
See the Toaster at our Appliance Stores, in the Restaurant at Massachusetts Avenue and all District Offices. The Appliance Department will answer all your questions and help you in every way
THE EDISON ELECTRIC ILLUMINATING CO. OF BOSTON.
Boost Your Business and Your Business will Boost You

BOSTON'S BUSINESS STIMULATING POSTER

test, planned along the line of stimulating more and better business both locally and nationally in the electric utility industry. Electric toasters were chosen for competitive sale, and it was announced in a striking poster reproduced here that any employee selling six toasters will be awarded one toaster; if twelve are sold, the employee is given either two toasters or a flat-iron; if eighteen, the prize is a percolator, flat-iron and toaster, or three toasters; and if twenty-four are sold, the employee is awarded a grill, percolator, flat-iron and toaster, or four toasters, with special prizes for those selling more than two dozen. Toasters are sold on either cash or part-payment bases, and the value of the toaster load was strikingly emphasized by the statement that if every one of the employees sold ten, the added load would equal the capacity of one of the company's large generators.

## Handling Service "Complaints"

BY F. M. HOUSTON
Sales Engineer Elmira Water, Light & Railroad Company, Elmira, N. Y.

WHEN a customer has something wrong with any appliance, or his lighting, we endeavor to treat him as if he were doing us a favor in notifying us, instead of acting as if he was making trouble for the company. The word complaint, we believe, is a misnomer, for 99 per cent of the trouble calls are not complaints, but merely the result of something wrong which the customer wishes remedied. We, therefore, try to make the customer feel that he is doing us a favor in reporting this trouble rather than saying nothing to us about it and telling his neighbor what a poor device he purchased from the company.

All service calls are now handled by one man. He enters them in a book made out in triplicate. The original goes to the service man, who makes the calls and repairs. The duplicate goes to the accounting department if there is to be any charge for the work done and the triplicate remains in the book. On all articles which are guaranteed for a year and on which the time has not expired there is no charge for any repair work or service done. On all other articles a charge is made for the material used and the time of the repair man. This charge more than covers the salary of the repairman and the cost of material. We do not believe in giving material away and see no reason why people should expect a public utility company to do it any more than they would a merchant or dealer.

A number of years ago we had one man busy running around putting in fuse plugs, for which we charged people merely the cost of the plugs. Now, if we have a call which requires replacement of fuses, a minimum charge of 50 cents is made in addition to the price of the fuses used, and we find that the people will pay this charge without any objections.

Each salesman we have out carries a small kit of tools and is instructed to make such minor repairs as he can whenever he finds appliances which need adjustments. This often gives him a chance to talk to the customer, otherwise he could not get inside of the house.

Each year during the months of January, February and March we make a survey of the town. At that time the salesmen get a list of the appliances in each house, and we have found that many times an electric appliance is not being used because the people were afraid it would cost a large sum of money to repair it. The salesmen all have a list of what the various repair jobs cost, and we find that the people are very glad to get this information and that invariably we get the repair work.

In conclusion we wish to emphasize the fact that we do not want the customer to get the idea he is making a complaint, because he is merely doing what any one would naturally do under like circumstances. As stated before, we are trying to make the customer believe he is doing us a favor in reporting the trouble.

## What Other Companies Are Doing

**Chicago, Ill.**—Total sales of appliances made by the Public Service Company of Northern Illinois have shown the following monthly increases over the corresponding period in 1921: January, 1922, 47 per cent; February, 11 per cent; March, 35 per cent, and an increase of 115 per cent for May. The increase for the five months of 1922 ended May 31 was 54 per cent over the same period of 1921. The sale of flat irons, curling irons, grills and cooking utensils has been the noticeable feature of the business.

**Kiefer, Okla.** — The following from the Kiefer *Enterprise* is an encouraging sign of the changed attitude of many newspapers toward the utilities: "The Oklahoma Gas & Electric Company got busy recently and painted its plant here. Then, to add more to its appreciation by Kiefer people, it has made a voluntary decrease in electric rates. 'Who says that a corporation has no soul?' "

**Wisconsin.**—The tendency in this State, according to the records of the State Railway Commission, is for municipal electric plants to purchase current from private companies. Out of sixty-nine publicly owned plants a year ago but thirty are now generating their own energy. Since 1915 seven municipal plants have been built in the state, while seventeen have been sold to private companies.

# Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

## Hydro-Electric Development and Steam Equipment

*Using Exhaust Energy in Reciprocating Engines.*—J. STUMPF and C. C. TRUMP.—There are a surprising number of cases where oil, gas or steam engines still show better economy than purchased power and electric motors, and this may be emphasized where the exhaust from steam engines is valuable for heating or process work. Any development which will improve the efficiency of reciprocating engines and at the same time simplify their construction should be of interest. The theoretical problems encountered are presented in this paper and practical applications to either single-cylinder or multi-cylinder engines are suggested and illustrated. — *Paper presented at spring meeting of the American Society of Mechanical Engineers, Atlanta, Ga.*, May 8, 1922.

*Developments in Power Station Design.*—The practical application of the laws governing the flow of fluids in pipes has hitherto involved the use of mechanical contrivances, but an electrical system which is claimed to give a high degree of accuracy and which merely involves the use of standard ammeters and watt-hour meters has recently been developed. The way in which this method is applied to the various meters used in a central station boiler room is described. — *Engineer*, May 19, 1922.

## Generation, Control and Switching

*Oil Switches for Direct-Current Circuits.*—W. WILSON.—Although the oil switch is an essential feature of practically all alternating-current systems, it has been used very little on direct-current systems, with the result that considerable uncertainty exists as to its fitness for this purpose. The author considers the need of an oil switch in connection with direct-current circuits, the principles involved in rupturing the circuit, the peculiarities of direct-current circuits as compared with alternating-current and the effect of these differences upon the oil break principle, and concludes with some examples of this particular apparatus in use today in direct-current installations. It was found after a series of tests that there was no risk of high peak voltages in opening a purely lighting load. With series motors or other slightly reactive loads similar to those used in an alternating-current circuit no more serious surge was developed than with an alternating-current oil switch. With other motors the starting and controlling apparatus must insure a complete circuit for the shunt field at all times to prevent serious surges. A complete installation of these switches for controlling three incoming and eight outgoing feeders is at work upon a direct-current colliery system, and has already cleared a short circuit without suffering in any way.—*Beama*, May, 1922.

*Boiler-Room Performance and Practice of the Colfax Station of Duquesne Light Company.*—C. W. E. CLARKE.—The purpose of this paper is to describe in some detail the operation of the boiler plant in this station. The first part of the article is taken up with a description of the fuel and fuel handling apparatus, stokers and clinkers grinder, ash-handling system and boilers. It then goes on to describe the operating conditions, giving tables of water evaporated, coal consumed, etc. A heat balance sheet for the four last months of 1921 is also included.—*Mechanical Engineering*, May, 1922.

## Transmission, Substations and Distribution

*Comparative Merits of Grounded and Insulated "Y" - Point Systems.* — M. KÖCHLIN.—A short study, giving the advantages and disadvantages of star-connected three-phase systems with grounded and with insulated "Y"-point. If the central station is connected with the distribution center with only one transmission line, the use of a grounded system would be dangerous. Only where a multiplicity of feeders is available, so as to cut off a faulty feeder without disturbing the others, is a Y-grounded system permissible. — *Revue Générale de l'Electricité*, May 6, 1922.

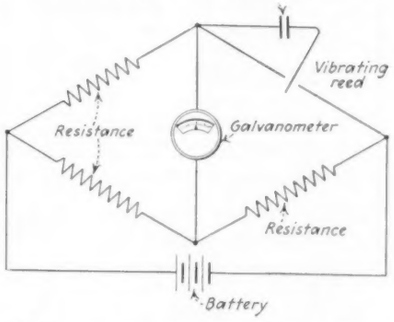
*Outdoor Switching Station at Gösgen for 135,000 Volts.*—Plans and description of a Swiss high-voltage outdoor switching station, interesting on account of its arrangement in two stories. The disadvantage of more difficult manipulation is compensated for by the more logical arrangement and the smaller floor space. Besides, it is not expected that the disconnecting switches in the upper story will have to be opened and closed very frequently. Gas pipes with a heavy copper coating are used as busbars.—*Zeitschrift des Vereines Deutscher Ingenieure*, May 6, 1922. (From *Schweizerische Bauzeitung.*)

*The Influence of Condenser and Choke Coil Protective Devices on Traveling Electric Waves.* — S. A. STIGANT.—Traveling waves such as occur from switching, arcing earths, lightning, etc., pass into the circuit with rectangular fronts. If this circuit is composed of coiled inductive windings, such a wave is a menace to the insulation of windings, and it becomes highly desirable to modify the shape of the wave from the rectangular form to a more gradual sloping one. This can be effected by shunting an electrostatic condenser from the transition point to ground. — *Electrical Times*, May 11 and 18, 1922.

## Units, Measurements and Instruments

*The Development of the Induction Meter.*—C. PAULUS.—A survey is given of the development of modern driving systems for alternating-current induction meters. The author comes to the conclusion that there has been no novel feature introduced in late years, all the improvements being restricted to the most suitable dimensioning. Most concerns today favor the three-legged iron core construction, arranged tangentially to the driven disk, and it is hoped that this design will ultimately be adopted as the universal standard type.—*Elektrotechnische Zeitschrift*, May 25, 1922.

*Development of Maxwell's Capacity Bridge.* — V. A. BAILEY. — One of the most accurate and convenient methods for determining capacity in electromagnetic units is that devised by Maxwell. In this method one side of the condenser, shown in the accompanying illustration, is made to touch *A* and *B* alternately by means of an electrically driven tuning fork. The author proves that in any general network which may also have several sources of emf. for which the variables have been adjusted so as to give no galvanometer deflection the permanently connected plates of the condenser may be connected to any point in the network without disturbing the galvanometer's state of deflection.—*Philosophical Magazine*, June 1922.




METHODS OF ACCURATELY DETERMINING CAPACITY

## Motors and Control

*Reducing Power Bills on Mine Fans with Synchronous Motors.*—FRANK W. CRAMER and A. A. MACDONALD.—The solution of the energy supply for mines is to purchase power from the public service corporations, as few mines are large enough to justify the installation of turbo-generators to furnish electric power. Even if they are, water conditions are such that it is impossible to use condensers. The power lines of

these corporations are now available in practically all mining districts and the rates are such that electrification is a money-saving proposition. Previous to the war the Midvale Steel & Ordnance Company acquired the Marianna, Acme and Hazel Kirk mines. A careful study revealed that the boiler plants in these mines were very inefficient and wasteful. After an investigation it was decided to buy all electrical energy and to replace all steam drive by electric drive. After a careful analysis of the various types of drives for mine fans the synchronous drive was adopted. The successful operation of these motors now justifies their adoption.—*Association of Iron and Steel Electrical Engineers*, May 1922.

*Commutation in Continuous-Current Dynamos.*—ALFRED STILL.—The author explains the theory of commutation by emphasizing the physical aspects of the problem and avoiding mathematical expressions and formulas of which the meaning and derivation cannot be easily understood. The article covers the theory of commutation, magnetic flux due to armature currents, formulas for calculating armature flux and end flux in the zone of commutation, commutating poles, methods of resisting flux pulsations under the commutating pole, leakage flux and pole-face windings.—*Journal of the Franklin Institute*, May, 1922.

## Heat Applications and Material Handling

*American Electrochemical Society Convention at Baltimore.*—A symposium which covers the manufacture of pig iron in electric furnaces, manufacture of synthetic cast iron from steel scrap or iron turnings, melting pig iron by electricity, desulphurizing cupola-melted gray iron, etc.—*Chemical and Metallurgical Engineering*, May 3 and 10, 1922.

*Instructions in the Welding of Iron and Steel.*—E. WANAMAKER.—The practice which influences the production of good welds is enumerated, together with the procedure followed for repair and maintenance work in the shops of the Chicago, Rock Island and Pacific Railroad. These practices are: (a) Careful preparation of the parts; (b) skill in the manipulation of the arc, and (c) a thorough knowledge of the thermal effects produced by the welding process.—*Electrical Review and Industrial Engineer*, May, 1922.

## Electrophysics, Electrochemistry and Batteries

*Experiments with Alternating Current in Direct-Current Electrolysis.*—W. B. JONES.—An investigation to study the cathodic overvoltage of lead electrodes in sulphuric acid during direct-current electrolysis by superimposing alternating current in an amount sufficient to give no reverse current, reverse current with and without corrosion, or reverse current equal to or greater than cathodic current. A study was also made of the cathodic overvoltage using an intermittent direct current. The method of making these analyses and the results are given.—*Paper presented at the American Electrochemical Society, Baltimore, Md.*, April 27, 1922.

*Crystal Growth in Metals.*—G. R. FONDA.—The author shows how the crystals in a metal vary in size and form according to the strains the metal is subjected to and according to how the metal is worked.—*General Electric Review*, May, 1922.

*The Rate of Combination of Copper and Phosphorous at Various Temperatures.*—C. A. EDWARDS and A. J. MURPHY.—A research carried out to determine the temperature at which rapid combination between copper and phosphorus commences, and to follow the effect of time on the progress of the reaction velocity.—*Engineering*, June 2, 1922.

## Traction

*Single-phase Locomotives with Individual Shaft Drive.*—BUCHLI and COUWENHOVEN.—Exhaustive studies, covering the last three years, have convinced one company that the multiple-rod drive for express locomotives, as used on the Swiss Federal Railways, is not as advantageous as the individual drive of each shaft by its own motor over a reduction gear. Particularly the vibration phenomena on engines with a rod drive are of a much more severe character than on the individual drive. Consequently a new series of locomotives has been developed, eight of which have been ordered for the Swiss Federal Railways. They are of the 2-C-1 class, and their very detailed mechanical description is given in this paper. The engines have a total weight of 92 tons and are driven by three 700-hp., 500-r.p.m. motors. Great advantages are claimed for the use of three bearings for each motor shaft. A number of vibration curves, recorded during normal operation of engines with a specially designed vibrograph, show the difference between rod drive and individual drive. A theoretical analysis of the new drive is given in a mathematical appendix to the paper.—*Brown-Boveri Mitteilungen*, May, 1922.

## Telegraphy, Telephony, Radio and Signals

*The Provision of Power for Wireless Telegraphy.*—J. H. WHITTAKER-SWINTON.—A survey has been made of the various forms of high-tension power which have been used in connection with continuous-wave wireless telegraphy. The present practice in experimental working in connection with transmitting sets of small power is reviewed with a statement as to the probability regarding the future. The essential requirements for producing "pure continuous waves" are set out and a description is given of successful methods. The conclusion is reached that direct current directly generated is inherently the best form of power to use.—*Beama*, May, 1922.

*Short-Wave Directional Wireless Telegraphy.*—C. S. FRANKLIN.—Investigations made with reflectors and wave lengths below 20 meters were commenced by Mr. Marconi in Italy in 1916, and then taken up later by the author in England. A coupled-circuit spark transmitter was developed, the primary having an air condenser and spark in compressed air. By this means a moderate amount of energy was obtained and the small spark-gap in compressed air proved to have a very low resistance.—*The Electrician*, May 19, 1922.

## Miscellaneous

*Oil Supplies.*—Four papers presenting the oil possibilities and reserves in Brazil, the United States, the West Indies and Colombia (Central America). Under the auspices of the U. S. Geological Survey, the American Association of Petroleum Geologists made an estimate of the oil reserves of the United States as of Jan. 1, 1922. This survey states that there was at that time 9,150,000,000 bbls. of oil of which over 4,000,000,000 bbls. are in the heavy-oil group, including fuel oils, and 5,000,000,000 bbls. in the light-oil classes. Contrary to the statement that the oil reserves in the United States will be exhausted in twenty years as has been erroneously reported, a long time will be required for the exhaustion of our oil fields. The West Indies do not constitute a promising area of oil reserves. On the other hand, Colombia presents a promising field for the production of oil in commercial quantities. This country (Colombia) is ideally situated, which should aid in the development of the oil fields.—*Mining and Metallurgy*, June, 1922.

*Fixation and Utilization of Nitrogen.*—A report prepared to correlate and make available under one cover the information on the fixation and utilization of nitrogen collected by the Nitrate Division of the War Department since its organization in 1917. It is based to a considerable extent on reports, papers and articles prepared by the officers and civilians associated from time to time with the activities of the Nitrate Division, as well as on the published technical and economic papers on the subject. In it is included a discussion of the world's nitrogen supply and demand, including a brief discussion of the prices of nitrogen. A résumé of the development of nitrogen fixation both in this and in foreign countries is given, followed by a technical and engineering description of the several nitrogen fixation and conversion processes, a discussion of research in its bearing both on the present and future possibilities of fixation, a history of the government activities in nitrogen fixation, a description of the United States Government's nitrogen plants and the bibliography referred to above.—*Document No. 2041 from the Nitrate Division, War Department.*

# News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

## Municipal Plants Beginning to Feel Effects of Coal Strike

While one effect of the coal strike has been to add industrial load to the circuits of the electric light and power companies owing to the inability of some industries to obtain fuel, the continuation of the strike, coupled with the strike of the railroad shopmen, is beginning to make itself felt. This is particularly true of numerous municipal plants which because of inability to obtain funds and lack of foresight had not stored sufficient coal to carry them over the long period of the strike. The privately owned electric public utilities have prepared for the strike better than other industries, and reports from various sections of the country indicate that private companies have no fear of coal shortage for some time to come.

Trouble has been experienced by municipal plants in Trenton, Carlyle, Highland, Staunton and Divernon, Ill. In addition the rates in Carlyle have been raised 50 per cent since the strike began. Reports from Iowa indicate that most of the plants there have sufficient coal to operate for a few weeks. Manifestations of coal scarcity are reported from northern Missouri. Other reports from Illinois indicate that some private companies have enough fuel to operate from six to eight months. No news of shutdowns has been reported from the New England, Middle Atlantic and Southern States.

## President Smith Appoints N. E. L. A. Chairmen

The following appointments of committee chairmen for the new administrative year of the National Electric Light Association were announced Thursday by President Frank W. Smith and ratified by the national executive committee in session at headquarters on that day:

Public Policy: Martin J. Insull, Middle West Utilities Company.

Customer Ownership: Milan R. Bump, Henry L. Doherty & Company.

Joint Committee for Business Development: E. W. Lloyd, Commonwealth Edison Company.

Accident Prevention: Charles B. Scott, Bureau of Safety, Chicago.

Company Employees' Organization: Robert B. Grove, United Electric Light & Power Company, New York.

Membership: Howard K. Mohr, Philadelphia Electric Company.

Wiring: R. S. Hale, Edison Electric Illuminating Company of Boston.

Rural Lines: G. C. Neff, Wisconsin Power, Light & Heat Company, Madison, Wis.

Constitution and By-laws: W. C. L. Eglin, Philadelphia Electric Company.

Doherty and Billings Prizes: A. S. Loizeaux, Consolidated Gas, Electric Light & Power Company, Baltimore.

Electrical Resources of the Nation: M. S. Sloan, Brooklyn (N. Y.) Edison Company.

Exhibition: C. L. Peirce, Jr., Hubbard & Company, Pittsburgh.

Electrification of Steam Railroads: Louis A. Ferguson, Commonwealth Edison Company.

Finance: Joseph B. McCall, Philadelphia Electric Company.

Insurance: Charles B. Scott, Bureau of Safety, Chicago.

Lamp: W. W. Freeman, Union Gas & Electric Company, Cincinnati.

Rate Research: Alex Dow, Detroit Edison Company.

Water-Power Development: Franklin T. Griffith, Portland (Ore.) Railway, Light & Power Company.

National Fire Protection Association: Member electrical committee, W. H. Blood, Jr., Stone & Webster.

National Industrial Conference Board: John W. Lieb, M. S. Sloan and Frank W. Smith.

Chamber of Commerce of the U. S.: National Councilor, John W. Lieb.

## Babson Boosts Electric Light and Power Securities

"Babson's Reports" of July 11 ("Barometer Letter" and the "Babson Chart") is devoted entirely to electric light and power securities. While there will be a wide diversity of opinion, some not at all complimentary to the compiler, the conclusions of the Wellesley Hills statistician are given herewith for what they are worth.

"At various times," he says, "different classes of local securities offer the best opportunity. At present electric power and light securities are the best local purchase. Manufacturing corporations depend almost wholly on the men in control. Railroads and tractions will for a while show up better, but they always will have labor and the automobile with which to contend. Gas companies have probably seen their best days. Water companies are being taken over by cities and towns. Merchandising—through the shortsightedness of local merchants—is fast getting into the hands of chain stores and mail-order houses. This leaves the electric power and light company as the most attractive local investment."

## North American Company Gets Squier Wireless Patents

The North American Company has just closed a contract with Gen. George O. Squier under which the company receives the exclusive license to use "wired wireless" under the Squier patents in the United States, as applied to central-station distributing systems and power-transmission lines for all purposes, such as broadcasting, signaling, telephone and telegraph, time-clock service, etc. Under the contract the North American Company is allowed to issue sub-licenses to other companies.

The North American Company has been making extensive experiments in Cleveland during the past two months and has obtained some results which indicate that there is a real future for this sort of central-station service. An article describing the Cleveland experiments, results obtained, circuits used, etc., will appear in the *Electrical World* in an early issue. A 50-watt set was used on the part of the system under test, and the area on which satisfactory reception was had was such that it took about 1 watt per square mile for satisfactory broadcasting.

According to Edwin F. Gruhl, vice-president of the North American Company, it is the purpose of the company to co-operate with the central-station industry as a whole, and it has taken this step because it believes control of "wired wireless" broadcasting over central-station lines should be within the central-station industry. Negotiations for the North American Company have been conducted by C. W. Hough, engineer for the company, who is in active charge of the radio-electric work.

R. D. Duncan, Jr., who has been chief engineer of the Signal Corps Laboratory, Bureau of Standards, has been granted a leave of absence from the War Department to accept an appointment as radio engineer with the North American Company, to carry on its experiments and developments.

## St. Louis Company to Use Powdered Fuel

Pulverized fuel will be used in the new plant of the Union Electric Light & Power Company at St. Louis. An order has been placed with the Combustion Engineering Corporation for complete pulverized-fuel equipment. This plant, according to the present order, will have eight large boilers using pulverized fuel.

# Senate Committee Rejects Ford Proposal

## Chairman Norris Denounces the Endeavor of the Detroit Manufacturer to Gain Control of Muscle Shoals—Senator's Own Proposal Also Disapproved

FINAL action on the Muscle Shoals proposals, so long before it, was reached last Saturday by the committee on agriculture of the United States Senate, when it rejected by a vote of nine to seven Henry Ford's offer for the lease and operation of the government power project at that site. The proposition submitted by Senator Norris, chairman of the committee, for operation of the plant by a government-controlled corporation was also rejected, the vote being nine to five. Both propositions now come before the Senate in the form of minority reports.

Senator Norris, in his report, after recounting at some length the purpose and the history of the Muscle Shoals development, proceeds to analyze Mr. Ford's bid for the property, which he regards as utterly inadequate and as designed for the aggrandizement of the bidder with scant regard for the interests of the nation or even of the farmers whose benefit it ostensibly promotes by the implied promise of cheap fertilizer. Some of Senator Norris' arguments, in condensed form, follow:

### Five Million Dollars for Property Costing Ninety Million

"The property that is to be conveyed to Mr. Ford has cost the government of the United States nearly $90,000,000. When the government commenced the construction of these great plants it was necessary to build homes for the workers. In fact, the government bought sufficient land and built a town at Nitrate Plant No. 1 and another town at Nitrate Plant No. 2. In addition to all this the federal government, under Mr. Ford's offer, will turn over to him more than $2,000,000 worth of personal property, much of which is absolutely new and has a definite market value.

"The two steam plants, capable of developing more than 120,000 hp., are as modern as any steam plants in the world. Nitrate Plant No. 2 is complete in every respect. There is nothing in the world superior to it. It can be started in full operation upon a day's notice.

"In consideration of the transfer by warranty deed of all of this property, the Ford corporation proposes to pay the sum of $5,000,000.

### No Guarantee of Cheap Fertilizer

"It is true that this corporation, by Mr. Ford's bid, is obligated to operate Nitrate Plant No. 2 to its full capacity, but there is no obligation to sell fertilizer or fertilizer ingredients at any fixed price. There is no agreement that the cost of fertilizer shall be reduced one penny, either to the farmer or to any one else. Contrary to the general opinion that the real estate speculators have so assiduously spread over the country, this corporation not only does not agree to sell fertilizer at a reduced price, but there is provided in its contract an agreement that on the fertilizer operations it shall have the right to 8 per cent profit. There is no limitation on the profit that can be made by the corporation either in its real estate operations or in its commercial activities other than fertilizer.

"After it has supplied the necessary power to operate Nitrate Plant No. 2, it will still have from 500,000 to 800,000 cheap horsepower to do with as it pleases, without any regulation whatever from the federal government or the state authorities of Alabama."

### What the 100-Year Lease Involves

After alluding to the possible need, in case of war, of the government's buying all this property back from Ford at greatly enhanced prices, Senator Norris goes on:

"Yet that part of the Ford offer sinks into insignificance when compared with that part of the proposition which provides for the leasing to the Ford corporation for 100 years of Dams Nos. 2 and 3.

"It is provided that these dams shall be constructed at the cost of the government. Every dollar that is expended comes out of the Treasury of the United States. Mr. Ford's corporation does the work of construction, but everything is paid for by the government. When the dams are completed a lease is given to this corporation for 100 years. The lease includes all of the government property, consisting of valuable real estate and improvements thereon, located on the banks of the river adjacent to Dam No. 2, and all of the government's personal property there in use. This personal property alone amounts to a very large sum of money, and the government has constructed there another town, complete in every way and modern in every particular. The government there owns 2,300 acres of land. All of this property is included in the lease. The government has constructed a railroad across the river. Everything is in absolute readiness for the Ford corporation to put its men into modern homes and set them to work.

"The government has already expended at Dam No. 2 $17,000,000. If the Ford offer is accepted, every dollar that has been paid from the Treasury of the United States for the construction of these homes, the railroad and the railroad equipment, and for the partial construction of the dam, is absolutely leased to this corporation without any pay whatever for 100 years. There is not even a pretense in the Ford offer to pay one penny for the 100-year lease to this town, fully equipped as it is, or for the benefit that accrues to the corporation on account of any of the other expenditures made by the government at Dam No. 2. All of these expenditures are absolutely donated to the Ford corporation.

### Scrapping the Water-Power Act

"Mr. Ford's offer is that Dams No. 2 and No. 3 when completed, together with all of the abutting property, shall be leased to this corporation for a period of 100 years. This provision of itself ought to be sufficient reason for the unqualified rejection of the offer. The question of the development of water power on our navigable streams has received a great deal of attention at the hands of Congress. The discussion finally culminated in the passage of the existing water-power act, which fixed the leasing term at fifty years. To lease this valuable water power to this corporation as proposed in the Ford offer would in effect repeal our water-power act. If this offer is accepted, it will be unfair to the water-power men who, after the long fight over the conservation of our water-power resources, have accepted the water-power act. It makes the water-power act in effect a scrap of paper."

### Taxpayers to Lend for 100 Years at 2.85 Per Cent

Senator Norris then takes up in detail the consideration for the 100-year lease proposed in the Ford offer, summarizing the situation as follows:

"The general public has been led to believe not only that the Ford corporation will pay 4 per cent interest on the government's investment in these two dams, but that by a plan of amortization it will repay the government's entire investment at the end of the 100 years, and it is said, therefore, that at the end of the 100 years the government will have received back the money it has invested. The plain, cold facts are, however, that giving this corporation credit for every cent of money that it pays at the time it pays it, either for interest or the so-called 'amortization,' we find that the cold mathematical conclusion is that the corporation has not only not paid any of the principal but it has paid only 2.85 per cent interest on the government's investment. In other words, it means that the government has, in effect, loaned to this corporation from $70,000,000 to $75,000,000 at 2.85 per cent interest for 100 years and has never received back one cent of the principal.

"We must not forget, however, that this great financial gift to this corporation does not end the privilege that comes to it under the Ford offer. Not only are the taxpayers financing this corporation at 2.85 per cent interest on a 100-year basis, but they are giving to this corporation unrestrained and unlimited liberty to sell the products which it manufactures without any regulation whatever.

Ford's proposal that the government shall maintain both dams in return for

insurance premiums from the corporation amounting to $55,000 annually is then denounced as absurdly unfair. "It is easily conceivable," Senator Norris says, "that this liability alone might cost the government not millions but billions of dollars before the 100-year period has expired."

"GREATEST GIFT EVER BESTOWED UPON MORTAL MAN"

Recapitulating the points of his attack on the offer of the Detroit manufacturer, Senator Norris declares:

"The country has been given to understand that Mr. Ford has guaranteed to reduce the cost of fertilizer by one-half. He has done nothing of the kind. He has made no guaranty of any kind in the way of the reduction of the cost of fertilizer. The country has been given to understand that he pays the government 4 per cent interest on its investment in the two dams. He does nothing of the kind. He has not made any such offer and no such proposition is included in his bid. The country has been given to understand that the Ford offer provides for the repayment to the government within the 100-year period of the entire investment that the government has made. His offer does nothing of the kind. The people of the country have been led to believe that the Ford offer means a reduced price for electricity to the consumer. It means nothing of the kind. He has not agreed to furnish a single kilowatt to any home or to any manufacturing concern except his own. The mighty power at Muscle Shoals will be devoted exclusively to the use of the great corporation which Mr. Ford will organize."

Putting the possible total profit to the corporation at the end of the 100-year period at fourteen and a half billion dollars, or more than one-half the United States' expenditure for the world war, Senator Norris exclaims:

"There is nothing in the history of the world with which this can be compared. It is the greatest gift ever bestowed upon mortal man since salvation was made free to the human race."

## Public Relations Section Begins Active Work

Under the chairmanship of H. T. Sands, of C. H. Tenney & Company, Boston, the Public Relations Section of the National Electric Light Association mapped out a year's work at a meeting of its executive committee in New York on Wednesday. Authorization was given for a continuation of the National Electric Light Association's good-will advertising and publicity program, and the committee announced that the annual convention program of the section will include papers on and discussion of the work of state committees on public utility information.

J. W. Carpenter, vice-president and general manager of the Dallas (Tex.) Power & Light Company, was appointed a member at large of the section's executive committee to fill the vacancy caused by the resignation of A. Hardgrave of Dallas, who has retired from the industry.

Appointments of committee chairmen were approved by the executive committee and announced as follows—Employee relations with the public—L. B. Herrington, Kentucky Utilities Company, Louisville; manufacturers' advertising—Phil Thomson, Western Electric Company, New York; public speaking—A. C. Marshall, Detroit Edison Company; Information Bureau organization—H. C. Abell, Electric Bond & Share Company, New York; uniformity of state regulatory laws—W. W. Freeman, Union Gas & Electric Company, Cincinnati; women's public information, Miss O. A. Bursiel, Boston; relations with financial institutions (a consolidation of the committee on relations with bankers and the committee on relations with savings banks), M. S. Sloan, Brooklyn Edison Company.

## I. E. S. Convention to Be at Swampscott, Mass.

Instead of holding its forthcoming annual convention at the Hotel Vendome, Boston, Mass., as planned, the Illuminating Engineering Society will meet at the New Ocean House, Swampscott, Mass., Sept. 25-28. This site, about 15 miles north of Boston and directly on the Atlantic shore, is at the gateway of a region of marked natural and engineering attractions. The general character of the convention program is unchanged from that outlined in the *Electrical World* for July 15, page 141.

## General Electric Jobbers Discuss Plans

The new policy of more intensive merchandising announced recently by the General Electric Company, by the establishment of a merchandising department, received its first active expression this week in the annual gathering of the General Electric Distributing Jobbers' Association at Association Island, Henderson Harbor, N. Y. The presence of Gerard Swope, the newly elected president of the General Electric Company, and George P. Baldwin, newly appointed merchandise manager, gave particular interest to the discussion of the broader aspects of the problem of distribution. F. M. Bernardin, Kansas City, was chairman.

Mr. Baldwin in his address stressed the fact that rights, not wrongs, must be considered the basis of any merchandising platform organized around the fundamentals of quality goods at a fair price, quick response to the market demand by distributors, an active practical sympathy by the factory and a constant service at all points. This address will be reported more fully next week.

F. S. Price, Boston, read a paper discussing the future of the jobber in which he analyzed the jobber's place and responsibility in the distribution of electrical goods and the needs of the moment. This paper will also appear in an early issue.

W. E. Robertson, Buffalo, made a very able analysis of the market for socket appliances, which he said is increasing more rapidly than any other market in the world. He urged definite commitments by jobbers, less frequent changes in design by manufacturers and better ethics in the multiplying of the agencies of distribution, as practical measures for the reduction of the cost of distribution.

In an exceedingly well-balanced program other manufacturers and jobbers presented the outlook in the different commodity markets. The spirit of the sessions was one of district optimism and purpose to proceed along intensive lines of merchandising development.

## New Orleans Utility Property Soon to Be Auctioned

The plan embodied in the ordinance adopted by the Commission Council of New Orleans, and reported in the *Electrical World* for April 22, page 798, looking to the reorganization of the New Orleans Railway & Light Company, is now in effect, the holders of 98 per cent of the company's 4½ per cent bonds having deposited their securities with the bondholders' protective committee, of which R. S. Hecht is chairman.

It is now proposed that, pursuant to to the reorganization plan, the property of the New Orleans Railway & Light Company shall be put up at auction some time in August, when it will be bid in by the protective committee representing the bondholders. The date of the sale, to be fixed soon by the special master, will be advertised for thirty days previously. Following the purchase of the property, another month may elapse before the receivership is finally discontinued, after which the new company will be launched.

## To Make Fertilizer in South

The manufacture of fertilizer on a large scale by electrochemical processes in North Carolina in the near future is not only a possibility but a strong probability. One commercial plant already is in operation and could be enlarged indefinitely if power were available. The plant referred to is the plant of the Piedmont Electrochemical Company, a subsidiary of the Southern Power Company of Charlotte, and is located at Mount Holly. The raw material used is Florida phosphate rock, which is imported by the carload. The product turned out is double superphosphate, which analyzes 48 to 54 per cent acid phosphate as compared with 16 per cent in the best of the old types of acid phosphate manufactured by the acidulation process by the use of sulphuric acid.

The prospect of the manufacture of

super-fertilizers on a large scale by the new process is largely based upon the plans for development by the Southern Power Company, the parent company of the Piedmont Electrochemical Company. Many of those in touch with the power company executives, though unwilling to be quoted, believe that the building of the two big plants now under construction by the Southern Power Company marks the resumption of a construction program that will embrace a number of new plants. Surplus power from these plants under construction and from other plants when they are built will, it is believed, be used in the manufacture of fertilizer. It is a well-known fact that the power company since its early days has kept in touch with the various processes for the utilization of electricity in this process. W. S. Lee, vice-president of the company, has made several trips to Europe to investigate methods of manufacture.

## Government Forms a Committee for Broadcasting

The membership of the interdepartmental advisory committee on governmental radio broadcasting, suggested by Secretary of Commerce Hoover, was recently announced by the Department of Commerce. The committee has made a preliminary classification of the kinds of material the several departments may have to broadcast, including market prices and data, weather and hydrographic news, standard radio signals (such as wave length and time signals), executive announcements, statistics and educational material. One of the functions of the committee is to advise regarding priority of the type of material to be broadcast.

It is possible the scope of the committee's activities may be extended beyond the subject of broadcasting and that it will act in an advisory capacity to the Secretary of Commerce in matters of government radio recognition and will consider all radio questions of interdepartmental interest.

The chairman of the committee is Dr. S. W. Stratton, and the secretary Dr. J. H. Dellinger, chief of the radio laboratory, Bureau of Standards.

In accordance with recommendations of the committee, an experimental system of government broadcasting by "primary" broadcasting stations has been established, utilizing only previously existing government stations and equipment. The "primary" stations broadcast official government news by continuous-wave (code) telegraphy to local broadcasting stations for rebroadcasting by radiophone.

The eight stations thus far included send out daily bulletins of government news, mostly agricultural market data. They are: Arlington, Va. (5,950 m.); Great Lakes, Ill. (4,900 m.); Washington, D. C. (1,980 m.); Omaha, Neb. (2,500 m.); North Platte, Neb. (4,000 m.); Roch Springs, Wyo. (3,000 m.); Elko, Nev. (3,000 m.); Reno, Nev. (3,200 m.).

# O.E.L.A. Discusses Rural-Service Problems

### New-Business, Meter, Operating and Illuminating Topics Considered at Cedar Point—National President Smith Outlines Future N. E. L. A. Activities

WHILE explaining his report on rural-line extensions at the Ohio Electric Light Association's convention at Cedar Point on July 14, G. E. Miller, chairman, stated that it was not his purpose to set up any mandatory rules, but rather to suggest a plan which may serve as a guide for various localities when pressure for this service becomes strong. The report favored a plan, similar to the Wisconsin rules, where the lines were to be built by the customers, then turned over to the utilities, which would maintain them, making a service charge to cover maintenance, depreciation, taxes, operating costs and losses plus the regular urban rates for energy at the origin of the extension. Using the urban rate schedule, Mr. Miller maintained that this would serve as an effective selling point because too often the high minimum charges scare off a prospective consumer. Various methods of refunding to the consumer his distribution credit on similar urban installations ranged from direct substraction of this value at the start to allocating it over a period of time by furnishing free service for a year.

In a stirring plea for the proper consideration of this subject, D. L. Gaskill, secretary of the association, declared that it was one that central stations could ill afford to ignore and that they must keep in advance of the procession if they did not wish to be compelled to give this service under enforced legislation. He felt that the average farmer would not be a large user of energy, since the average consumption is from 15 kw.-hr. to 20 kw.-hr. per month, but with just rates there was no reason why the utilities should lose money on this service. By properly educating the farmer through his grange and similar associations, electricity on the farm, Mr. Gaskill predicted, would be as indispensable within ten years as the telephone is today. He recommended that because of future expansion a voltage lower than 6,600 should not be used. He also urged that the initial rates be high enough to avoid undue trouble and difficulties when an advance in rates becomes necessary.

J. C. Martin of Columbus said that it is the duty of the utility itself to see that the construction of rural lines was up to the standard and not of the kind that lasts for only two or three years. Considering the energy demand, he found, from the little information at hand, that various classes of farmers existed. The demand of a dairy farm run by an agriculturist would be far different from that of a "dirt" farmer. A study of these various demands by the association would aid in the solution of the problem.

The discussion of new-business problems was opened by H. N. Wood's report of the year's work, which considered two points in the question of central-station finance. These were how to place the problem effectively before the public and the selling of junior securities to consumers. Keeping up the value of the property was one of the best solutions in maintaining the value of these junior securities. C. G. Eichelberger, Union Gas & Electric Company, Cincinnati, dealt with the commercial industrial lighting problem. He felt that in this field, together with a proper study of highway lighting, an increased load could be obtained. Discussing the field of industrial heating, A. C. Shepard declared that the question of rates should be calculated on a basis of unit cost of production before a heating rate was discarded as apparently too high.

#### President Smith's Address

Frank W. Smith, president of the National Electric Light Association, in his first address before the O.E.L.A., outlined the future activities of the parent body. He recognized the customer-ownership movement as a healthy one and thought that the 1,600,000 security holders in electrical utilities must gain a much better understanding of the problems confronting the management of these utilities. The public, as the real owner of this business, Mr. Smith said, has the control of it through the commissions. Mr. Smith favored a uniform national accounting system which, following broad lines, could give due consideration to local conditions. He said that he was opposed to the California water and power acts because they were against private enterprise and that they were patterned after the Hydro-Electric Power Commission of Ontario. Tracing the outcome of the activity which in 1920 was termed "public relations" and which has now led to the establishment of public utility information bureaus in eighteen states, Mr. Smith declared that, while it may take a long time to reverse public opinion, nevertheless this work must go on, because a utility is a public servant and can serve the public effectively only when relations are amiable. He thought the rural-lines situation would be one of the most important in the coming year and said there was no questioning the fact that the farm of the future would be electrified.

#### Meter Committee's Report

S. C. Henton, Northern Ohio Traction & Light Company, Akron, chairman of the meter committee, in covering the year's work, declared that kilovolt-ampere apparatus was now available and

that the problem of educating and training the meter personnel was growing. He recommended co-operation with the thirty-six colleges in Ohio in order to offset the growing lack of metermen. Considering the increase in time interval on demand-meter design, it was found that differences of but 1½ to 3 per cent were noticed when this interval was advanced from five to thirty minutes. Fewer complaints on these larger intervals have been noted. The longer a company has used these meters, it appears, the longer is the interval favored.

Pleasure at the way the O. E. L. A. has reached the smaller utility was expressed by J. C. Langdell, Jackson, Mich. He also dicussed the need for standardization of service entrance construction, since fire hazards are greatly increased by improper fusing, grounding and wire protection at the meter. With more than 10,000 ground wires installed at Jackson and Muskegon, satisfactory service has been maintained and hazards reduced. W. H. Pratt, General Electric Company, reported that as yet artificial sapphires for meter bearings have not proved satisfactory. In discussing the revision of Circular 56, Bureau of Standards, he favored the change in Rule 7(c) to place the meter not less than 4 ft. nor more than 7 ft. above the floor, since it facilitated reading and checking the meter.

### Powdered Fuel and Other Topics

That boiler and furnace efficiencies of 90 per cent will be attained through the use of powdered fuel was a prediction made by H. M. Bromley of Youngstown, a member of the station-operating committee. Mr. Bromley traced the rise of powdered coal for fuel from the German experiments in 1893 to the modern practices. He considered three methods of transporting this fuel—namely, a screw combination with a bucket elevator, a mixture with air which is piped to the point of use, and a measured quantity delivered to storage tanks and then blown into the furnace.

### Relation of Manufacturer to Merchant

In handling the subject "The Relation of the Manufacturer to the Merchandising Group of Business Men," George Bailey of Chicago said that this was more of a "gamble" for the manufacturers than was the building of larger equipment, since contracts are usually let for the latter type of work and rigid laws of economics function for the smaller equipment. Since distribution performs a service, he considers the cost of distribution entirely justifiable. Mr. Bailey outlined several tasks for the manufacturer. There were, first, improving the product by better designing and by lowering production costs; second, standardization; third, lowering packing cost; and, fourth, popularizing the convenience outlet.

Captain L. Davis of the National Contractor-Dealers' Association condemned the flat-rate basis for outlets since too often it afforded a chance to substitute inferior materials. Captain Davis also referred to the extremely high overhead charges and quoted figures showing that a 28 per cent average was found in companies with an annual combined total merchandising and contracting income of $100,000.

### New Officers

The officers elected for the ensuing year are: President, E. L. Franklin, Warren; vice-president, Frank Espy, Canton; secretary-treasurer, D. L. Gaskill, Greenville. The executive committee consists of W. A. Wolls, Columbus; O. H. Hutchings, Dayton; T. O. Kennedy, Cleveland; Robert Lindsay, Cleveland, and W. W. Freeman, Cincinnati. The following are the new chairmen of their respective committees: J. Wright, Toledo, meter; R. R. Krammes, Newark, transmission and distribution; J. J. Dolan, Coshocton, station-operating; J. H. Truman, Jr., New Philadelphia, new business. The success of the convention may be determined by the registration of 624, which compares favorably with the 400 registered last year.

## Connersville Company to Build Semi-Automatic Substations

Work on the improvement program of the Hydro-Electric Light & Power Company of Connersville, Ind., is progressing rapidly, and the work of erecting additional power plants will be started soon, it was announced recently by William Insull, district manager of the organization. The plans call for dredging the hydraulic canal, which extends from the feeder dam 7 miles north of Connersville substation to a point just south of that city, and the construction of five substations. The cost of the improvements will be about $200,000. The amount of energy to be derived from the increased facilities will be six times that now received.

Turbines having a rating of 1,640 hp. and generating 1,380 kva. will be installed at the five stations. The largest of these will be built just south of Connersville. L. F. Harza, hydro-electric engineer of Chicago, made the plans and will supervise the work.

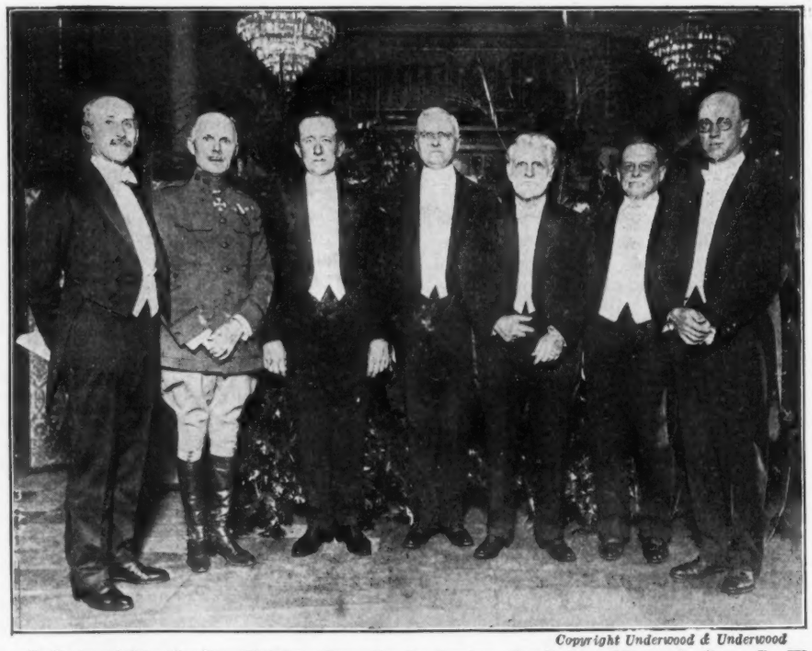
All power plants will be semi-automatic in operation and will be controlled from the central power plant. The central station is controlled by the Interstate Public Service Corporation, which operates at Newcastle.

## Expansion and the Message of the Lighting Engineer

The slogan "Electrify America" of the joint committee for business development was interpreted at the Cedar Point convention of the O. E. L. A. by A. K. Baylor of Schenectady as expressing the committee's purpose in stirring up national activity in the electrical industry. He explained that this committee, consisting of twelve members from the various national organizations, would not direct, but intended merely to point the the way to the electrical expansion of the country. With only $18 as an average annual revenue per consumer with ordinary lighting load, Mr. Baylor declared that the sum should increase to $50.

Characterizing the illuminating engineer's message as experience applied

## Marconi Receives the John Fritz Medal



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Left to right—Orville Wright, Gen. G. O. Squier, Guglielmo Marconi, Gen. G. W. Goethals, Ambrose Swasey, Prof. Elihu Thomson, Prof. C. A. Adams.

satisfactorily through common sense, G. H. Stickney, Edison Lamp Works, Harrison, N. J., expressed the thought that there was as much style in lighting as there is the correct design of clothes. He urged better lighting in the homes of central-station men since this would give them effective selling points for increasing their station loads.

M. Luckiesh of Cleveland declared that the entire lighting job was not more than half done, since this represented the relative proportion of renters to home owners, of the lighted rural homes to the urban homes and of the lamps per home to those needed for effective illumination. Mr. Luckiesh quoted figures taken from a survey of 1,500 middle-class urban homes which indicate that the average home has only 5.7 rooms, with a lamp wattage of 863, an average of 2 convenience outlets, 1.6 portable lamps and 2 wall brackets; whereas there should be 9 convenience outlets, 9 portable lamps and 9 wall brackets for real lighting.

## Los Angeles Enlarging San Francisquito Plant

As a result of taking over the city distribution system of the Southern California Edison Company, the city of Los Angeles is preparing to increase its generating facilities. When the San Francisquito No. 1 plant was constructed ten years ago, provision was made for a fourth unit in addition to the three placed in service at that time. This fourth unit is now to be installed. Contract for furnishing the impulse turbine, which will develop a maximum of 16,000 hp., has been awarded to the Pelton Water Wheel Company of San Francisco, which furnished the other three turbines. The 12,500-kva. gen-

SAN FRANCISQUITO PLANT SUPPLIED LOS ANGELES WITH MORE THAN 63,000,000 KW.-HR. IN 1920-1921

erator will be furnished by the Westinghouse Electric & Manufacturing Company. The Pelton company will also supply a 57-in. needle valve. The effective head at this plant ranges between 800 ft. and 900 ft.

President R. F. Del Valle of the Department of Public Service of Los Angeles says in his annual report that the San Francisquito hydro-electric plant No. 2 has proved very profitable. Against a total cost for the plant development of $3,310,000, Mr. Del Valle states it has made a saving of $1,023,704 to the city during its two years of operation. Announcement is made that taxes will be collected this year from the people of Los Angeles to pay the interest and principal on about $20,000,000 outstanding electric bonds. This item amounting to nearly $1,700,000 will be met from power revenues.

During the year 1920-1921 63,500,000 kw.-hr. was produced and distributed at a cost of $274,320. Basing the saving on cost to the city of purchased energy, Mr. Del Valle says that the first year's operation saved $462,414.

# Hartford Utility Aids Railroad to Maintain Electrical Service Despite Strike

### Offers Linemen to Railroad and the Entire Force of a Power Station — Railroad Uses Linemen and Station Operators

REALIZING that the strike of maintenance forces on the New York, New Haven & Hartford Railroad on July 1 threatened the continuity of service in the electric zone east of New York City, Samuel Ferguson, vice-president of the Hartford Electric Light Company, offered the services of linemen, substation and power-plant workers to the transportation company, and as a result of the temporary employment of central-station men in maintenance activities the situation was promptly relieved. On July 3 Mr. Ferguson wired General Manager C. L. Bardo of the railroad as follows

HARTFORD, CONN., July 3, 1922.
C. L. BARDO, General Manager N. Y., N. H. & H. R. R. Co., New Haven, Conn.

DEAR MR. BARDO:—I regret to see by the papers that, guided by bad leadership, a large number of your men have placed themselves in the position of flouting a decree of Congress as expressed through its authorized representative, the Railway Labor Board. Under such circumstances it is obviously the duty of every citizen to uphold the government of this country and to assist in every possible way to overcome a misguided effort of a small class of employees to tie up the transportation of the country and to bring suffering and discomfort to all law-abiding citizens. Experience has shown that the employees of this company are true Americans, and I feel confident that you can count on their assistance to do their part in supporting the government in such capacities as you may specify. Already our linemen have reported to your Bridgeport superintendent. You will pay them the standard wages as fixed by the United States government, in addition to the full pay which they will receive from this company while performing their volunteer duties in the interest of law and order.

In case of dissatisfaction at your Cos Cob power station we are prepared on sixty minutes' notice to shut down one of our steam plants and to transport the entire force, from janitor to superintendent, to Cos Cob. This we can do without imperiling the power supply of the city, but at a very considerable sacrifice of operating efficiency. I cannot but believe that as soon as your men understand what an impossible situation their leaders have got them into they will repudiate such leadership, as, except for some hotheads, they are as good and law-abiding citizens as the rest of us.

Yours very truly,
THE HARTFORD ELECTRIC LIGHT COMPANY,
S. FERGUSON, Vice-President.

Mr. Bardo accepted the services of a number of men experienced in the maintenance of high-tension lines and in power-plant electrical maintenance, and these promptly reported for duty at Stamford and Cos Cob, the headquarters respectively of the overhead-line and power-plant departments of the electric zone. As a result of the temporary service of these men the integrity of the overhead-line service was unimpaired, and within a few days some 114 striking maintenance employees from the road's electrical department not only returned to work but withdrew from the union. In appreciation of the Hartford company's services, the following letter was written to Mr. Ferguson by Mr. Bardo:

DEAR MR. FERGUSON:—Confirming my telegram of last evening concerning the return of the high-tension men you so kindly loaned us to help out through the trouble at Cos Cob and on our electrified line: Messrs. ——, —— and ——, who have been assisting Mr. Gilliam, were released and left for Hartford by train late yesterday afternoon. Messrs. ——, ——, —— and —— were also released and left for Hartford in an automobile during the evening. It is impossible for me to express through the medium of a letter the very deep appreciation we feel for the very real and much-needed help you afforded us during this trouble. Over and above the immense value of the actual physical service the men rendered, the moral effect of your offer and of the practical work of the men was the greatest help in straightening out the unsatisfactory tangle.

While they were with us all of the men were, of necessity, paid the 70-cent-per-hour rate authorized by the United States Railroad Labor Board. It is my understanding that, in addition to this, your company continued them on your payroll at their regular rates, and I will consider it a favor if you will render us a bill for this amount plus the expense that both your company and the men must have been put to. The return yesterday of all of our high-tension men and the recruiting of some six or seven switchboard operators, together with the return of the remainder for whom jobs were still open, have straightened us out entirely so far as the power house and transmission system of our electrification is concerned, and I feel that the action of yourself and your company was in a very large measure, responsible for the early change in sentiment of those of our men who were involved.

Again expressing our very deep appreciation of your efforts, and thanking you for all you have done, I am, yours very truly,
C. L. BARDO,
General Manager.

## Conviction for Stealing Electricity in Georgia

The Ware County Light & Power Company of Waycross, Ga., recently obtained a jury verdict of guilty against a former customer for theft of electrical energy by bridging around the meter, and the defendant was sentenced to pay a fine of $250 or serve twelve months on the county roads. The defendant's attorney brought out the fact that there was no record of a case of the kind ever having reached the Georgia Court of Appeals. Perhaps the argument most convincing to the jury was a reproduction of the meter board and the wiring arrangement used by the defendant to defraud the company. The guilty customer had been served through five residence and business meters and is endeavoring by an offer of restitution to obtain a resumption of service.

# Brief News Notes

**Department of Agriculture Extends Its Radio Service.** — Government weather, crop and market reports are to be broadcast daily from the Arlington and Great Lakes wireless stations of the Navy Department, the United States Department of Agriculture has announced. This makes possible the receipt of agricultural reports by radio throughout virtually the entire United States and is the most important step yet made in broadcasting agricultural information, according to W. A. Wheeler, in charge of the radio work for the department. In less than two years the department's radio service has grown to be nation-wide.

**Consolidation in Indiana.**—The purchase of the Benton Harbor-St. Joseph Railway & Lighting Company by the Indiana & Michigan Electric Company of South Bend, Ind., for $1,200,000 gives the South Bend company control of the electric power distribution to practically all important towns in St. Joseph and Elkhart Counties in Indiana, and Berrien, Cass and St. Joseph Counties in Michigan. The deal also gives the South Bend company control of the interurban lines connecting St. Joseph with Dowagiac and Watervliet, Mich. The company will further expand by erecting a dam costing $1,000,000 in the St. Joseph River.

**Seattle Holds First Radio Show on Pacific Coast.**—Seattle's first radio show was held at the Dreamland Rink on June 5 to June 10. This was the first show of its kind to be held on the Pacific Coast. It included an exhibit by the United States Navy of a receiving station, with a 600-ft. aërial, through which messages were received from Nauen, Lyons and other European stations. There was also a transmitting station, operated by the American Radio Relay League, by means of which radiograms were forwarded to any location in the United States, free of charge. The Western Electric Company presented a vacuum tube film, brought from New York, showing the action of a radiophone.

**Mr. Webster on Electrical Progress in Japan.**—Edwin S. Webster of Stone & Webster, who has just returned from Japan, where he inspected the hydro-electric plant on the Sho River which the company is constructing, says that Japan is making excellent progress, particularly in the hydro-electric field. There is being constructed a comprehensive network of electric transmission lines throughout the empire. Coal is comparatively expensive so that the possibilities for economy in industrial operation with hydro-electric power as contrasted with steam stations are attractive. Electric lighting of homes is quite general in Japan, even in rural districts Mr. Webster said, instancing one country place where a tiny 30-kw. hydro-electric plant in full operation supplied energy for residences in the surrounding rural district, many of which use only one lamp.

**Development in Eastern Oklahoma.**—The Eastern Oklahoma Light & Power Company, with headquarters at Tulsa, is building high-tension lines and distributing systems from the Sand Springs line to Avant, Osage and other places. Fourteen miles of poles have been set and the distributing system at Avant is almost completed.

**Nally Prophesies Early Transoceanic Conversation.**—Speaking at a dinner given at New York in honor of Guglielmo Marconi, E. J. Nally, president of the Radio Corporation of America, indicated that the development of the electron tube opened the way to telephone conversation between New York and London and Paris within a few years. Success in experiments is expected before the end of 1922. The tone of the human voice, it was asserted, already has been hurled across the sea from wireless telephone sets, but only in one direction, so that the radio engineers who made the test did not know until they had received notice by wireless telegraph some minutes later that they had actually reached their scientific goal.

**New Rate Schedules Filed.**—New rate schedules for domestic consumers have been filed with the Ohio State Public Utilities Commission by the Springfield (Ohio) Light, Heat & Power Company, to continue in effect pending settlement of the domestic rate controversy in Springfield. The new schedule provides for a rate of 10 cents for the first 15 kw.-hr., 7 cents for the next 45 kw.-hr., and 3 cents for all additional energy consumed. The former rate was 11 cents for the first 15 kw.-hr. and 7 cents for all additional current. The rate became effective July 10. The city will file a protest against the new schedule, officials announced July 7. A rate of 8-6-3 has been demanded by the city and rejected by the power company, which maintains it would lose money under that rate.

**Cities Service Resumes Cash Dividends.**—The directors of the Cities Service Company have authorized the announcement of a plan for the payment of dividends in cash on the preferred stock on Sept. 1 and the preference stock on Oct. 1 and the redemption of all scrip issued for dividends on these stocks. It is proposed to give the holders of preferred and preference stocks or the holders of the scrip issued in lieu of lash dividends on these stocks either in cash or, at their option, a special debenture bond created solely for this purpose. This special bond will bear 8 per cent interest and will be convertible into 85 per cent of preference stock and 15 per cent of common stock, with the cumulative feature on the common stock as in previous issues of debentures. It will carry an initial call price of 115 per cent of par.

**Glossary of Electrical Terms Finds Wide Distribution.**—Six hundred copies of the glossary of electrical items prepared by direction of the Electrical Manufacturers' Council have been taken by the Bureau of Foreign and Domestic Commerce for distribution to customs officials throughout the United States. It has, besides, been placed in the hands of the entire electrical trade of the United States and has received general approval.

# Associations and Societies

**Pennsylvania Electric Association.**—The fifteenth annual convention of the Pennsylvania Electric Association will be held at Bedford Springs, Pa., Sept. 6, 7, 8 and 9.

**Accounting and Commercial Sections, N. E. L. A., Fix Dates for Meetings.**—At a recent meeting of the executive committee of the N. E. L. A. Accounting Section in New York, a schedule of group meetings was adopted as follows: Salt Lake City, Sept. 4-6; Atlantic City, Oct. 25-27; Cincinnati, Jan. 15-17, 1923. On the first two days meetings of the committees of the section will be held and on the third day the meeting of the section's executive committee. At a Commercial Section executive committee meeting the following schedule of meetings was arranged: Section executive committee, Association Island, Henderson Harbor, N. Y., July 28; group meetings: French Lick Springs, Ind., Sept. 28-30; Boston, Nov. 15-17; Denver, Jan. 24-26, 1923.

### Coming Meetings of Electrical and Other Technical Societies

A complete directory of electrical associations is published in the *Electrical World* in the first issue of each volume. See July 1 issue for latest list.

A. I. E. E., Pacific Coast Convention—Vancouver, B. C., Aug. 8-11. F. L. Hutchinson, 33 West 39th Street, New York, N. Y.

Michigan Electric Light Association—Ottawa Beach, Aug. 21-23. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

International Association of Municipal Electricians—New Bedford, Mass., Aug. 22-25. C. R. George, Houston, Tex.

N. E. L. A. Geographic Divisions — New England, New London, Conn., Sept. 5-8; Rocky Mountain, Glenwood Springs, Col., Sept. 18; Great Lakes, French Lick Spring, Ind., Sept. 28-30. M. H. Aylesworth, 29 West 39th Street, New York.

Association of Iron and Steel Electrical Engineers—Cleveland, Sept. 11-15. J. F. Kelly, Empire Bldg., Pittsburgh, Pa.

American Electrochemical Society — Montreal, Sept. 21-23. A. D. Spillman, Columbia University, New York City.

Illuminating Engineering Society—Swampscott, Mass., Sept. 25-28. Samuel G. Hibben, 29 West 39th Street, New York.

American Institute of Mining and Metallurgical Engineers—San Francisco, Sept. 25-28. F. F. Sharpless, 29 West 39th Street, New York.

National Association of Railway and Utilities Commissioners — Detroit, Sept. 26. J. B. Walker, New York Transit Commission, New York.

Empire State Gas and Electric Association —Lake Placid, Oct. 5-6. C. H. B. Chapin, Grand Central Terminal Bldg., New York.

American Electric Railway Association—Chicago, Oct. 2-6. J. W. Welsh, 8 West 40th Street, New York.

# Commission Rulings

**Evil Results of Competition.**—The keen competition between the electrical utilities for the light and power business of Indianapolis has not, the Indiana commission declared in rate-fixing proceedings, reduced the rates to the general public, because "a duplication of utility facilities is economically unsound and wasteful and the public bears the burden. The competition has, however, benefited certain large consumers whose business is so desirable that agents of the utilities have attempted to outdo each other in stretching the provisions of the published schedules, sometimes, in their enthusiasm, forgetting the published schedules entirely."

**Employee Pension System.**—The San Joaquin Light & Power Corporation urged in the recent rate proceedings before the California Railroad Commission that an allowance be made in operating expenses for the estimated actuarial cost of a pension system for its employees. The plan favored requires a permanent annuity of approximately $120,000 per year, and this amount was included in the company's estimate of operating expenses for 1922. The commission points out that if the system were put into operation immediately the actual out-of-pocket cost for the first year would be small and it is not of particular importance whether the permanent annuity be set aside at the time of the inauguration of the system or a year or two later, but if there is to be any such system it should be within a reasonable time put on a permanent actuarial basis; otherwise the cost in later years would be prohibitive. The decision whether to inaugurate such a system is, the commission says, part of the responsibility of the management, rather than of regulation, and the company, if it wishes, can establish the system and then justify its cost as a part of the operating expenses.

**Massachusetts Commission Sustains Capitalization of War-Time Plant Costs.**—War-time plant construction costs incurred by the North Adams Gas Light Company were sustained by the Massachusetts Department of Public Utilities in a recent decision authorizing the company to issue additional capital stock of $605,000 par value. The city opposed the company's petition partly on the ground that a substantial part of the plant expenditure was incurred during the period of excessive war costs. In its finding the commission pointed out that the company postponed as long as was deemed prudent the installation of additional generating capacity and equipment required for the adequate supply of its territory. In this connection the board said: "We are not prepared to decline to approve securities to an amount reasonably necessary for plant additions clearly required for the public convenience merely because the cost at the time the work is done exceeds the cost of like work prior to the war or its probable cost when normal conditions return. However, this circumstance has a direct relation to the provision for depreciation."

**Condemnation of "Present-Value" Theory of Rate Base.**—In fixing a rate base for the San Joaquin Light & Power Corporation the California Railroad Commission said: "Any attempt to substitute 'present value,' or reproduction cost new, depreciated, for the methods of fixing the rate base heretofore followed by the commission would result finally in disaster to the companies themselves. It would have to be followed in periods of declining as well as of rising costs, and this would be particularly calamitous to a company like the San Joaquin, which has been compelled by its obligations to its consumers to make very large investments during a period of high prices. . . . It ought not to be compelled by a false theory of valuation applied to its obligatory investments in public service to take a speculative risk on its investments from which unregulated businesses may exempt themselves. To the extent that its expenditures have been reasonable and wisely made, considering the conditions existing, it is entitled from the public, if reasonable rates for the service permit, to compensation for its expenditure, in the form either of a continuing return or of a chance to amortize a part of the investment during periods of prosperity. On the other hand, if the 'present value' cannot safely or soundly be applied to high-cost improvements during a subsequent period of declining costs, it also cannot be applied in the reverse conditions to properties constructed during low-cost periods and now still in the public service at a time when it would cost more to reproduce them. The consumers are entitled to the advantages of stabilization in the one case, just as the company is entitled to its safety in the other. It happens that at the moment the 'present value' theory would result in a valuation advantageous to the company and unattractive to the consumers. There is therefore a tendency on the part of utility companies to favor and of consumers to oppose it. The method of valuation followed by the commission results at the present time in lower rates. But the time is bound to come, at least in some utilities, when the reverse will be the case. The more stable method of valuation hitherto followed by the commission is sound and just in both instances and ought not to be charged either against the consumers on a rising market or against the companies on a falling market. The sound basis is to take reasonable costs as of the date of construction, regardless of whether the cost new would be higher or lower."

# Recent Court Decisions

**Commission Has Power to Order Refund Because of Inadequate Service.**—The Supreme Court of the United States has sustained the Oklahoma Corporation Commission in ordering the Oklahoma Natural Gas Company to refund part of the payments made for its service during a period when this service was inadequate, declaring that by its charter the company was required to render efficient service and that it was competent for the state to compensate the deficiency in the service by ordering a rebate, no infringement of the Fourteenth Amendment being thereby entailed.

**Delegated Police Power Subject to Revocation.**—In deciding that the authority to fix street-railway rates is vested in the Municipal Council of New Orleans and not in the Public Service Commission of Louisiana, the Supreme Court of that state pointed out that the constitutional provision that the exercise of the police power of the state shall never be abridged does not preclude the state from delegating the police power to an administrative board or commission, or to a municipality or other political corporation, but merely prohibits an irrevocable surrender of the police power and requires the delegation of any part of the police power to an administrative board or municipality to be subject to revocation by act of the Legislature of the state. (91 So. 533.)*

**Structure Attractive to Children Offers Implied Invitation to Boy Not Trespassing.**—A petition in McCoy vs. Texas Power & Light Company to recover for the death of a boy fourteen years old, which alleged that defendant maintained on the land of the boy's father a steel tower carrying high-tension electric power lines without any warning of the danger therefrom and having thereon steps whereby one could ascend to the top of the tower where he was in danger from the electric currents, even though he did not come in contact with the wires; that the people in the neighborhood had no knowledge of the danger from such currents if they did not touch the wires, and that the defendant thereby impliedly invited the boy to climb upon the tower, as a result of which he was killed without coming in contact with the wires, was held insufficient by the inferior courts and, on the plaintiff's refusal to amend the complaint, the case was dismissed. The Commission of Appeals of Texas has found that, on the doctrine of attractive nuisance, a cause of action was stated and has ordered the suit tried. (239 S. W. 1105.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men
Engaged in all Branches of the Electrical Industry

## Walter Neumuller Treasurer of N.E.L.A.

Walter Neumuller, who was elected treasurer of the National Electric Light Association at its recent convention

WALTER NEUMULLER

held at Atlantic City, has taken an active part in association affairs for many years. For five years he occupied the office of assistant secretary of the Association of Edison Illuminating Companies, and he also held the secretaryship of the exhibition committee of the N. E. L. A. from 1909 to 1912, during which time exhibitions were held in Chicago, Atlantic City, St. Louis and Seattle. He has, besides, served on many committees of the national societies. Mr. Neumuller was born on June 21, 1886, and was graduated from the New York public schools in 1899 and from business college in 1900, after which his education was continued through attendance at night schools and private study. He entered the employ of the New York Edison Company in 1900 as an office boy in the contract and inspection department and in 1903 was transferred as a clerk to the statistical bureau. In 1907 he was appointed private secretary to Arthur Williams, who was then general inspector of the company. His next promotion was to be special representative in 1914, and in 1917 he became assistant to the general commercial manager, the duties of general agent, retail, being added in 1918. Mr. Neumuller was appointed an assistant secretary in the latter part of 1919 and at the following annual meeting of the company was appointed secretary of the company. In addition, Mr. Neumuller is also secretary of the Yonkers Electric Light & Power Company and the Thomson-Houston Electric Light Company of Yonkers, treasurer and director of the Electrical Show Company, president and director of the New York Electric Garage Corporation and president and director of the New York Electric Vehicle Association. He is a member of numerous clubs and associations, both local and national, and is the president of the New York Electrical League, a life member and past-vice-president of the New York Electrical Society, a member and past-chairman of the New York Companies Section of the National Electric Light Association, an honorary member of the Association of Employees of the New York Edison Company and a member and past-vice-president of the Gas & Electric Choral Society.

**Robert Sibley**, who has been editor of the *Journal of Electricity and Western Industry*, published by the McGraw-Hill Company of California in San Francisco, and also of its predecessors, since 1911, has been made editorial director of that paper and also Pacific Coast editorial director of the *Electrical World* and *Electrical Merchandising*. Mr. Sibley is a well-known figure in the electrical industry of the Mountain and Pacific States. He has been connected with various engineering and public utility enterprises in that region, has served as professor of electrical and mechanical engineering at the universities of Montana and of California and, as editor of the *Journal*, has long been in intimate contact with the industry. In his new post, as Pacific Coast editorial director of the three McGraw-Hill electrical papers, Mr. Sibley is in a position to do a great deal toward interpreting the problems of the electrical industry on the Pacific Coast and in the Mountain States and in promoting the interest of the industry in general.

## A. Hardgrave Leaves the Public Utility Field

A. Hardgrave, who has been in active charge of the Middle West Utilities properties in the Southwest, with headquarters at Dallas, Tex., has removed to Kansas City to take active charge of the City Ice & Cold Storage properties there, which with several associates he has purchased. Mr. Hardgrave has been in the public utility field for eighteen years and since 1913 has been associated with the Insull interests. For the last two years he has been active in association affairs in the Southwest, one year as president of the Southwest Utilities Association, and for the entire two years he has been the president of the Southwestern Geographic Division of the National Electric Light Association.

## G. Grenville Hunter Publicity Manager I. G. E. Co.

G. Grenville Hunter has been appointed publicity manager of the International General Electric Company, succeeding Don Cameron Shafer, who resigned as advertising manager on June 1 to take up literary work. The

G. G. HUNTER

broader title of publicity manager has been chosen for the position, the advertising managership having been merged into it. Mr. Hunter was born at Southampton, Long Island, in 1892 and attended Trinity College at Hartford, Conn. On leaving college he took charge of the publicity department of a New York banking house and subsequently engaged in mercantile business. Early in 1919 he entered the service of the General Electric Company and was successively employed in the accounting, production and advertising departments. A year later he was placed in charge of the International General Electric Company's commercial service work and also appointed editor of the *Digest*, the house magazine of the International General Electric Company. Mr. Hunter will have his headquarters at Schenectady, N. Y.

## Philadelphia Electric Elects New Officers

The board of directors of the Philadelphia Electric Company has recently been increased to eleven members through the election of Horatio G. Lloyd and William A. Law. Three additional vice-presidents were also chosen, A. B. Huey, vice-president in charge of the legal department; C. J. Russell, vice-president in charge of the commercial department, and W. C. L. Eglin, vice-president in charge of the engineering department. W. H. Johnson is still the senior vice-president of the company.

## W. S. Heald Elected President N.C.E.A.

W. S. Heald, the newly elected president of the North Central Electric Association, is a graduate electrical engineer of the University of Michigan, class of 1912. The summer of 1912 he spent with the Whitman & Barnes Manufacturing Company in Chicago. He then was employed by the Stone & Webster Corporation on design work at Keokuk, Iowa. He was with the Mississippi River Company in 1914-15 as assistant engineer and in

W. S. HEALD

1915 went to Duluth, Minn., as manager of the commercial service department and engineer, and he has remained in that city until the present. "Wally" or "Shorty," as his friends know him, is one of those fortunate men who join to physical stature a vigorous and well-balanced mentality that makes for real leadership. In his work in Minnesota he has come to be known and liked for his sound judgment and ability to make things "go" in any job given him to do.

**Major Raymond A. Wheeler,** on duty at Fort Benning, Ga., has been recommended to succeed Major Cary H. Brown as assistant engineer commissioner of the District of Columbia. It is expected that he will take office on Aug. 1.

**Lieut. Col. Harold L. Trotter** has opened a consulting engineering office at Montreal. Colonel Trotter has had a large experience in electrical construction and will specialize in that branch of engineering.

**A. H. Midgley,** connected with Scholey & Company, Ltd., electrical and mechanical engineers, London, is visiting the United States for a short time. Mr. Midgley is conspicuous among his associates for his brilliancy as a designer of electrical machinery. He is visiting the States to negotiate the sale of some of his electrical patents.

**Frank Vaughan** of the Vaughan Electric Company, St. John, N. B., was the recipient of the degree of doctor of science from the University of New Brunswick at the recent convocation exercises. This honorary degree was granted by reason of Mr. Vaughan's unusual standing as an electrical engineer.

## Marconi Leaves America

After spending three weeks in America, during which time he was honored by American scientists and engineers, Guglielmo Marconi sailed for home July 8. While here he visited many radio stations and several large manufacturing plants. He was honored by the Institute of Radio Engineers through the bestowal of a medal of honor and was presented with the John Fritz medal by the other engineering societies.

## R. S. Hale Again Chairman N.E.L.A. Wiring Committee

It is not surprising that a man who has engaged so actively in association work as has Robert S. Hale for several years should again be selected to direct the work of the wiring committee of the N. E. L. A. Mr. Hale has not confined his activity to this committee but has taken a prominent part also in the rate research committee of the association. At the present time he is superintendent of the special research department of the Edison Electric Illuminating Company of Boston, after having been first assistant to the general superintendent and later superintendent of the sales department of the company.

Mr. Hale was born in Boston, Oct. 3, 1869, and was graduated from Harvard with the degree of A. B. in 1891 and from Cornell with the degree of M. E. in 1893, besides taking a degree of A. M. at Harvard in 1892. After graduation from Cornell he became associated with the Edison Electric Illuminating Company of Boston, but resigned after two years to become an expert for the Steam Users' Association, a body composed chiefly of the New England cotton mills. After the completion of his work with this organization Mr. Hale entered the service of the Mutual Boiler Insurance Company as engineer and also entered the electrical business, first alone and later in

R. S. HALE

partnership under the firm name of R. S. Hale & J. S. Codman. It was in 1904 that he again became associated with the Boston Edison company. Mr. Hale was the founder of the Sales Managers' Association.

# Obituary

**David D. Faris,** manager of the marine department of the Westinghouse Electric & Manufacturing Company, died suddenly in his office at the East Pittsburgh works of the Westinghouse company on Monday, July 10. Death was due to apoplexy. Mr. Faris became associated with the Westinghouse Electric & Manufacturing Company in 1915, when the Westinghouse Machine Company, with which he had been connected since 1904, was absorbed by the electric company. At the time of the consolidation Mr. Faris went to East Pittsburgh and was made assistant to the manager of the power department of the company. In 1919 he became assistant manager of the marine department and on July 1 of this year was appointed to the managership of the department.

**Col. B. A. Enloe,** chairman of the Tennessee Railroad & Public Utilities Commission, died July 8 at Nashville, Tenn. He had been ill for a number of months.

**Martin S. Decker,** of Albany, N. Y., formerly a member of the Interstate Commerce Commission and chairman of the Public Service Commission for the Second District of the State of New York, died recently in his room in the Prince George Hotel, New York. His death resulted from heart disease, induced by an attack of acute indigestion. He was sixty years old and was born at Rosendale, N. Y., of an old New York family. His long connection with the Interstate Commerce Commission began in 1886 when he was appointed docket clerk. His selection by Governor Hughes as one of the Public Service Commissioners in 1907 was no surprise, for Mr. Decker had long been recognized as an authority on transportation law and practice. During 1909 and 1910 he was president of the National Association of Railway Commissioners and he served as chairman of the Public Service Commission for the Second District of the State of New York in 1913 and 1914.

# Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

## Blanketed Distribution—The Other Side

### Group Organizations of Jobbing Houses Do Not Restrict the Small Manufacturers Who Create Market

By F. M. Bernardin
President the B-R Electric Company, Kansas City, Mo.

I WOULD like to add a word to the discussion of the small manufacturer's distribution problem. My point is that the electrical business will progress in proportion to the education given to the general public in the uses and advantages of electrical appliances. The expense of this promotion must be provided by the manufacturer, distributor and by the dealer. Any manufacturer who sells his products without giving this consideration to the public who will ultimately use his article is not functioning as a constructive factor in electrical merchandising. I ask the question, Is the small manufacturer contributing any creative effort in this direction?

Of course, this also applies to an electrical jobber who simply issues a monthly price bulletin and depends upon a mail order business for his existence. A creative jobber, besides issuing a general catalog annually, must maintain a high grade corps of salesmen and also a publicity department. Without these factors in his organization it is impossible for him to educate the dealer and promote the general use of electrical appliances.

#### Helps All Manufacturers

A recent article which appeared in your paper states that the small manufacturer and the small jobber are able to underbid the larger companies because their overhead is so much lower, but I feel positive that if the small manufacturer would add a promotion charge to his overhead in the same proportion to that of the larger manufacturers, and would apply this appropriation to the creative development of business, he would soon find his costs as great as those of the large manufacturer. This is also true of the small jobber. In reviewing the promotional support which electrical manufacturers have given to their products in the process of selling to the ultimate consumer, you will find two things. The two large electrical manufacturers whom the small manufacturer accuses of having blanketed the field by allying themselves with the

F. M. BERNARDIN

prominent distributors in different territories are advertising and creating a market with the ultimate consumer, not only for their own products but the products of all electrical manufacturers. If the small manufacturer would assist in this his products would be given full consideration by the consumer on their merits and in this way he would automatically create a distributor for his wares.

#### Need Not Lose Territory

It is not true that a distributor who allies himself with a large manufacturer is compelled to give up lines of merchandise which have been identified with his organization prior to this alliance. It all depends upon the merits of the product, plus the promotion and advertising support which the manufacturer will apply. But suppose a condition does arise whereby a small manufacturer is unable to secure a creative jobber in a particular territory. In this event the small manufacturer can put a direct representative in this territory and solicit his merchandise direct to the dealer, asking a price for this merchandise which would take care of his selling overhead.

I feel positive that, with the proper constructive representation in this territory, in a short time this manufacturer would have created a demand for his merchandise which would be a welcome additional line to any jobber regardless of his manufacturing associations. The trouble today is that the small manufacturer, by eliminating a promotion overhead, comes to the jobber who has an established line and asks him to change simply because there is a few cents difference in price. If this small manufacturer would create his market he could soon find a jobber who would continue this promotion.

#### Build by Direct Sales

A case was cited in the article before mentioned where a certain manufacturer has lost twenty-two large distributors in seven years because these houses were taken over by a big jobbing system. Had this same manufacturer immediately placed direct sales representation in these jobbing centers and kept his creative market active, I believe that he soon would have found ample distribution in these territories. I can cite an instance in our own territory where a large electrical manufacturer has no distributing outlet for his rubber-covered wires. But instead of giving his distribution to a non-creative jobber he solicits this product direct from the dealer and central station, asking approximately the same price for this merchandise which is being charged by the constructive jobbers in this territory. This manufacturer will eventually have the opportunity of selling this product through a distributor, be-

cause he is earnestly promoting the sale of his product to the trade and ultimate consumer.

Therefore, in summing up this whole subject, I believe that if all the electrical manufacturers and their allied distributors would give more thought to promoting the use of electricity in the 5,000,000 homes which at the present time are not wired but are in reach of central station lines the general demand for electrical appliances would increase so that all electrical manufacturers, large or small, would secure a volume in proportion to their creative effort. This, of course, applies to the electrical jobber as well.

# The Price Element in Wire Buying

## Why Wire Prices Based on Fair Profit Over True Costs Give Practical Protection to Buyer and Seller

BY L. S. HORNER
Vice-President the Acme Wire Company, New Haven, Conn.

THE magnet wire industry is in the throes of price cutting, which is resulting in a decided disadvantage both to the producer and consumer. The situation is not dissimilar to that recently described in your article by Leroy Clark.

A general improvement in business is evident. Reacting from this, there should, also, be evident a growing trend toward fair prices, based on true costs. For the buyer who prides himself on forcing down the price of his regular supplier below what he should know is the cost of production, in my opinion, is doing his own firm a decided injury. One of two things must be the result. Either the quality of the product must be lowered to meet the price or the ability of his supplier to continue to supply him will be reduced.

### WHY A FAIR PRICE?

"Why should I pay a 'fair price,'" the buyer says, "when a perfectly reputable company is willing to cut its price below cost?" My reply is this. You can't afford to have your wire manufacturer, or whatever regular supplier it may be, forced to accept your orders below cost. Your supplier must be strong financially, able to meet his obligations, and continue his development and research work to improve the product which the buyer must have. Also, you must make it possible for this supplier to have at least the nucleus of a trained, skilled corps of workers on which to build a force when business becomes more normal. But if your supplier cannot prosper he cannot do this.

The electrical business is strong and growing fast. The days will come again when the demand will equal, possibly exceed, the supply. And the firms who in these days pay a fair price and stand by the suppliers are the ones who will then get the deliveries and also a continued fair price based on true costs.

The memory of the cut price buyer is too short. He forgets, although 1920 is only two years back. Well may he recall, however, the prices he had to pay because he did not have one or more regular suppliers on whom he could rely to give him the quality and schedules he ordinarily requires.

The far-seeing buyer of the company competing with this cut price buyer had this kind of suppliers and relied upon them and was supported by them. And I firmly believe that fair prices and good deliveries in boom times far more than offset the saving in cut prices in times of moderate business. The earnings of the stockholders are greater in the long run, because the greater volume at fair prices is real, while the apparent saving on today's small volume is imaginary, due to the product that is so often being made to meet the price.

The shop does not register strongly enough with many executives to impress him with the fact that the product costs more because the quality has been lowered.

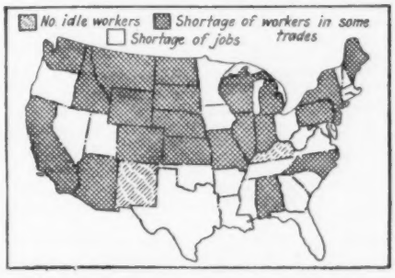
There is another important factor. The man who purchases goods on price only overlooks the necessity of service. By this is meant, broadly, that he must have support of manufacturers who possess the ability to meet special conditions of design or demand. Oftentimes a large contract for a finished article may depend on the ability to produce a sample promptly, determine its cost elements and submit them for test with the proposal. Also possibly a far more important element in service is the ability of a supplier to determine intelligently the cause of trouble in a customer's product, sometimes due to defective material supplied, more often due to conditions under which the material is being used in the manufacturing department of the customer. It requires knowledge and experience correctly to diagnose such conditions and this service costs money, but it often saves the customer many times his total purchases of wire for a month or more.

### SELL THIS CONCEPTION

Another kind of service is the unusual demand of a regular customer requiring night work, Sunday and holiday overtime to produce special product costing many times the price asked. This service is what really ties the supplier and consumer together with bonds no cut price can break, provided that the buyer is really protecting the best interest of his own company by tying up to the suppliers who can give this kind of service.

Manufacturers of wire must sell this conception of the practical worth of service and of quality along with the wire that they deliver to each customer. Buyers must be informed, instructed and gradually educated as to what is actually purchased with fair price that cannot be sold by any man who is compelled to accept a cut price for his goods.

## Present Labor Distribution




THIS map shows the crying need for some kind of a "labor load dispatcher" to guide the workers to the work. At present in twenty-three states there is a shortage of jobs; in twenty-three a shortage of workers.

## Increased Demand for Radio Parts Noted

Jobbers in the Chicago district report an active demand for standard parts in radio material. Complete sets are not selling well, it is said, but these stocks are being built up for the fall business, which is expected to be very large. Head tele-

phones and vacuum tubes are now available in better quantities than formerly. Improved radio market conditions are reported in New York and Boston districts.

No product of electrical manufacturers has ever taken the world so by storm as has the radio-telephone receiving set, according to a statement just made by the electrical division of the Department of Commerce. "Outside of a few countries where existing political conditions have imposed restrictions, the use of radio is being taken up universally. The development has been most rapid in this country, but in Europe, in South America, in Australasia, and to some extent in Africa and Asia, broadcasting stations are being installed, with a resultant increasing demand for receiving sets.

"In spite of an enormously increased manufacturing capacity, makers of radio equipment are still behind on their domestic orders, and this has naturally limited their interest in export trade. Nevertheless, the total value of equipment shipped abroad during the first five months of this year is more than 60 per cent of the total for the calendar year 1921, and the inquiries from abroad have increased considerably. As productive capacity here catches up with the domestic demand a strong export trade may be expected."

## Conduit Sales Continue to Increase

Conduit sales in all parts of the country continue to increase. Demand in the New York territory is unusually strong, jobbers asserting that the great amount of new construction during the summer months is making itself most felt in this market now.

In Chicago the situation has changed very little. Prices range from $45 to $46 per 1,000 ft. for the ½-in. black pipe in 5,000-ft. lots. Stocks are low.

Prices of conduit in St. Louis are: ½-in. black, $47.75 per 1,000 ft.; ½-in. galvanized, $54.60 per 1,000 ft. Demand is reported improving and stocks are larger than they were three weeks ago.

The conduit market in San Francisco is slow. With the exception of two or three scattering carloads, there is little business in sight. Prices: ½-in. galvanized, $6.20 per 100 ft.; black, $5.95 per 100 ft. Stocks are reported fair.

## Bank Clearings Last Week Gained 23.7 per Cent

The margin of increase in bank clearings over last year's figures widened appreciably this week, an aggregate of $6,946,163,924 at twenty cities in the United States, as reported to *Dun's Review*, representing a gain of 23.7 per cent over the $5,615,997,835 of the same week in 1921. The decrease from the clearings of two years ago continues, the loss this week being 9 per cent. Compared with last year's totals, Kansas City alone reports smaller clearings this week, the reduction being only 0.3 per cent, and the increases elsewhere range from 6.2 per cent at Minneapolis to 36.7 per cent at Portland, Ore. For the centers outside of New York which are included in the statement, the week's clearings of $2,439,963,924 are 13.3 per cent in excess of those of a year ago, while New York City, with $4,506,200,000, reports a gain of 30.1 per cent.

## Refrigerating Plants Are in Good Demand at Boston

Marked activity in the sale of electrically driven refrigerating plants has been evident at Boston during the past fortnight, according to W. J. Debler, manager of the home office of the Boston Kelvinator Sales Company. Twenty-four outfits, including refrigerators, were purchased for one apartment house and twenty-one sets without refrigerators for another within ten days, and new business inquiries are coming in at a rapid pace. Two units have just been ordered by one of the large Boston hospitals, and nearly two dozen units have just been sold through the Edison Electric Illuminating Company's appliance department. To a representative of the *Electrical World* Mr. Debler stated that the outlook is exceedingly attractive and that deliveries vary from stock shipments to about three weeks' maximum, according to the size and type of apparatus desired. The building boom in New England is unquestionably stimulating the demaand for motor-driven labor-saving equipment of various kinds, and there appears little prospect of a curtailment in the demand for refrigerating plants for many weeks to come.

## Safety Switches in Greater Demand

Solenoid-operated switches are in much greater demand than a year ago, all sections of the country being represented in orders received, said G. E. Palmer, president of the Palmer Electric & Manufacturing Company, Cambridge, Mass., last week to a representative of the *Electrical World*. Industrial plants in particular are showing increased interest in safety switches, and sales are running about 50 per cent ahead of last year.

Inquiries are also fairly active from foreign sources. The Cambridge factory is operating on a fifty-hour weekly schedule, and the working force is double that employed a year ago.

## Concise Data Table Shows Progress in Business

| | Latest Report | Preceding Month | Year Ago |
|---|---|---|---|
| **TRADE INDICATORS** | | | |
| Pig-iron production, daily average, tons | 74,409 | 69,070 | 39,394 |
| Unfilled orders, U. S. Steel Corp., tons | 5,254* | 5,097* | 5,482* |
| Iron and steel exports, monthly | $17,559 | $18,837* | $25,911* |
| Twenty railroads' gross earnings, monthly | $250† | $280† | $258† |
| Freight cars loaded, weekly average | 798,300 | 786,700 | 762,800 |
| Bank clearings, weekly average, N. Y. | $4,400† | $4,700† | $3,900† |
| Checks cashed, weekly average, N. Y. | $5,300† | $5,000† | $3,900† |
| Failures, number | 1,803 | 1,948 | 1,326 |
| Building permits, value, 163 cities | $229† | $217† | $141† |
| Merchandise exports, U. S. monthly | $308† | $321† | $330† |
| Merchandise imports, U. S. monthly | $254† | $217† | $205† |
| **BANKING FUNDS** | | | |
| Bank of England gold holdings | $628† | $628† | $622† |
| Bank of France, circulation, francs | 35,852† | 35,827† | 37,494† |
| Federal Reserve Banks, total reserves | $3,148† | $3,135† | $2,626† |
| Federal Reserve Banks, total loans and investments | $1,099† | $1,189† | $2,061† |
| Federal Reserve Banks, circulation | $2,126† | $2,128† | $2,635† |
| Sterling exchange, demand | $4.40 | $4.44 | $3.75 |
| Balance of trade, monthly | $54† | $104† | $125† |
| **PRICES** | | | |
| Iron, bessemer, Pittsburgh | $26.96 | $26.96 | $24.46 |
| Petroleum, Kansas and Oklahoma, per bbl | $2.00 | $2.00 | $1.00 |
| Cotton, spot, N. Y., lb. | $0.222 | $0.215 | $0.112 |
| Wheat, No. 2 red, cash, Chicago | $1.20 | $1.28 | $1.44 |
| Corn, No. 3 white, cash, Chicago | $0.63 | $0.61 | $0.61 |
| Railroad stocks, average 20 | $83.73 | $86.33 | $66.45 |
| Industrial stocks, average 20 | $93.07 | $95.05 | $65.36 |
| Railroad bonds, average 20 | $87.03 | $86.90 | $72.88 |
| Cost of food, Annalist Index ($145 in 1914) | $185.25 | $184.37 | $163.83 |

*Thousands. †Millions.

## Electrical Market Conditions for First Two Weeks in July

| | New York | Chicago | Boston | Atlanta | St. Louis | San Francisco | Salt Lake City-Denver | Portland Seattle |
|---|---|---|---|---|---|---|---|---|
| Conduit | Active | Active | Active | Active | Active | Slow | Steady | Active |
| Armored cable | Active | Steady | Active | Steady | Active | Active | Steady | Steady |
| Wire | Slow | Active | Slow | Active | Steady | Steady | Active | Steady |
| Sockets | Active | Steady | Steady | Steady | Slow | Steady | Slow | Active |
| Knobs | Active | Steady | Steady | Steady | Active | Active | Steady | Active |
| Switches | Active | Steady | Steady | Active | Steady | Steady | Slow | Steady |
| Hollow ware | Active | Active | Active | Active | Steady | Active | Active | Active |
| Lamps | Active | Active | Active | Steady | Active | Steady | Active | Steady |
| Motors | Active | Steady | Steady | Slow | Steady | Active | Steady | Steady |
| Refrigerators | Active | Steady | Active | Active | Active | Active | Active | Steady |
| Soldering sets | Steady | Steady | Steady | Active | Steady | Steady | Steady | Steady |
| Washing machines | Slow | Steady | Active | Active | Active | Active | Active | Active |
| Vacuum cleaners | Slow | Slow | Active | Steady | Steady | Active | Active | Steady |
| Fans | Steady | Active | Steady | Active | Active | Active | Steady | Active |
| Trend of prices | Firm | Up | Up | Firm | Up | Firm | Up | Firm |

## Revenue Freight Loadings Decreased 960 Cars

Loading of revenue freight totaled 876,896 cars during the week ended July 1, compared with 877,856 cars during the preceding week, or a reduction of 960 cars, according to reports just filed by the carriers with the American Railway Association. This was an increase of 100,817 cars over the corresponding week last year, but a decrease of 14,725 cars compared with the corresponding week in 1920.

Coal loadings during the week amounted to 94,748 cars, a decrease of 2,212 cars compared with the preceding week and a decrease of 62,365 cars compared with the same week last year. It also was a decrease of 98,286 cars compared with the same week in 1920.

Merchandise and miscellaneous freight, which includes manufactured products, totaled 575,146 cars, an increase of 616 cars over the week before and 104,120 in excess of the corresponding week in 1921. It also was 74,667 cars above the total for the corresponding week two years ago.

Ore shipments continued the increase begun some weeks ago, the total being 64,776 cars, or 492 more than were loaded during the preceding week. While this was an increase of 34,010 cars over the corresponding week last year, it was a decrease of 6,896 compared with the corresponding week in 1920.

## Use of Electric Ranges Is Increasing Rapidly

Approximately 140,000 electric ranges are in use in the United States today, compared with 10,000 in 1915. It is estimated that at least 54 per cent of these ranges are installed west of the Rocky Mountains. About 6,000 communities with electric service have special electric cooking rates. The record of the Associated Manufacturers of Electrical Supplies shows that 21,739 electric ranges were manufactured in 1919 and 41,000 in 1920. Last year, it is estimated, 30,000 electric ranges were installed, and this year it is predicted 100,000 will be sold.

## Building Contracts in June Amounted to $343,440,000

Building contracts awarded during June in twenty-seven Northeastern states, according to the F. W. Dodge Company, amounted to $343,440,000. Except for the record figures of April and May of this year, this is larger than any previous monthly total. It is only 5 per cent under the record May figure and shows a 52 per cent increase over the month of June last year.

The continued high rate of activity has brought the total amount of construction started in the first six months of this year up to $1,690,984,000, which is by far the highest figure for the first half of any year. It is 59 per cent greater than the figure for the six-month period of 1921.

In the six months' record are the following items: $682,663,000 for residential construction, an increase of 89 per cent over the corresponding period of 1921; $288,932,000 for public works and utilities, being 19 per cent over last year; $280,329,000 for business buildings, 94 per cent more than last year; $164,641,000 for educational buildings, 56 per cent over last year, and $123,181,000 for industrial plants, an increase of 42 per cent over the corresponding period of last year.

Contemplated new work reported from Jan. 1 to July 1 has amounted to slightly more than $3,000,000,000, compared with $1,690,000,000 for work actually started in the same period.

## Eastern and Southern Failures More Numerous

Failures for the past week were decidedly more numerous than those reported for the previous week, the increase being especially evident in the East and South, while the Pacific section showed no change in its total. Defaults reported to R. G. Dun & Company this week aggregated 455, compared with 306 for the week before. For the corresponding week a year ago 324 insolvencies were reported.

While the 225 failures with liabilities of $5,000 or more in each case are more than the 185 similar defaults reported in the week before, they form only 56 per cent of the total, as compared with 60.4 per cent a week ago. For the corresponding week in 1921 the number of such defaults was 171, and the percentage 52.7.

## German Radio Market Slumps

A heavy slump has hit the radiophone manufacturing industry in Germany as a result of a sudden cessation in demand from the United States, according to reports from that country. Several American agents now are attempting to cancel orders, it is said. The prices are dropping rapidly.

## Metal Market Situation

The recent advance of copper to 14 cents, delivered, is said to be a logical market increase in contrast with artificial advances when economic conditions did not warrant it. Many sales have been made at the high price and consumers seem very willing to pay it. The fuel and transportation troubles are causing some uncertainty in the trade, and it is felt that when these are cleared up there will be a wholesome buying movement.

NEW YORK METAL MARKET PRICES

| Copper | July 12, 1922 | July 20, 1922 |
|---|---|---|
| London, standard spot | £ s. d. 63 2 6 | £ s. d. 63 2 6 |
| | Cents per Pound | Cents per Pound |
| Prime Lake | 14.00 | 14.00 |
| Electrolytic | 14.00 | 14.00 |
| Casting | 13.35 | 13.35 |
| Lead, Am. S. & R. price | 5.75 | 5.55 |
| Antimony | 5.05 | 5.05 |
| Nickel, ingot | 36.00 | 36.00 |
| Zinc, spot | 5.50 | 5.50 |
| Tin, Straits | 31.37½ | 31.62½ |
| Aluminum, 98 to 99 per cent | 19.10 | 19.10 |
| OLD METALS | | |
| Heavy copper and wire | 10.50–11.00 | 10.50–11.00 |
| Brass, heavy | 5.50– 5.75 | 5.50– 5.75 |
| Brass, light | 4.87½–5.00 | 5.00– 5.12½ |
| Lead, heavy | 4.62½–4.65 | 4.62½–4.65 |
| Zinc, old scrap | 2.87½–3.00 | 2.87½–3.12½ |

# The Week in Trade

Prices When Quoted Are Those Reported at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

DEMAND in the electrical market continues to improve in all sections of the country. Steady calls are noted for conduit boxes, which were advanced approximately 10 per cent on July 15. Flexible armored conductor is in active demand with excellent deliveries. This material is becoming more popular than rigid conduit in many quarters owing to the present lower prices. Warmer weather has done much to increase fan sales during the last week. Stocks are reported ample. Rubber-covered wire demand is fair and stocks are good. Most orders for motors are for the smaller sizes. Sewing-machine sales are slow, there being poor response to jobbers' and dealers' efforts. Sporadic sales feature the washing-machine market.

## New York

### Sales Increasing—Conduit Demand Is Good—Fan Sales Heavy—Outlet Boxes Advance

Sales of electrical materials are increasing in this district. Prices are generally firm, the only increase of the week being a slight advance in the price of outlet boxes. Dealers are reporting a greater response to sales initiative and a better demand for washers and cleaners. The industrial lighting market is a trifle sluggish at this time, and few orders of any size are noted.

**Conduit.**—Good demand is noted in this line. Recent price advances have not affected sales.

**Fans.**—Hot weather during the past week has caused record sales.

**Outlet Boxes.**—Prices have advanced materially, but demand continues to gain.

**Lamps.**—Stocks are being built up in order to meet the fall demand, which is expected to be very active.

## Chicago

### Conduit Boxes Advance—Steady Demand for Wiring Materials—Lamp Trade Brisk

Business in the electrical trade has traveled another week on the plane established during the past month. The call for wiring materials is still progressing, although some scarcity of the smaller sizes of conduit is evident. The flexible armored conductor has not felt a very active demand since most of the construction has been on new houses. Conduit boxes advanced about 10 per cent on July 15. High-tension manufacturers are reporting a good volume of business transacted.

**Wire.**—The flow of rubber-covered wire is still steady, and the No. 14 sells for $6.25 per 1,000 ft. in 5,000-ft. lots. A slightly strengthened market is noticeable, but jobbers are attempting to maintain this price to consumers of standing. Stocks are normal. Action on bare and weatherproof has not changed, and they are moving slowly. Prices are the same at 16½ cents per pound.

**Conduit.**—The conduit market has changed very little since prices range from $45 to $46 per 1,000 ft. for the ½-in. black pipe in 5,000-ft. lots. Stocks on this size are low, but the larger sizes are available.

**Flexible Armored Conductor.**—The building industry is calling for more wire and conduit than armored conductor. No. 14, two-wire, single-strip, is quoted at $42.50 per 1,000 ft. in 5,000-ft. lots. Stocks are good.

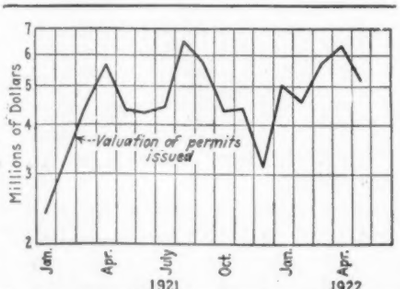
**High-Tension Equipment.**—A carload shipment of busbar supports and disconnecting switches for the Pacific Coast was reported by one manufacturer. This maker received orders for two 900-kva., 33,000-volt steel-tower substations for the Middle West and one 600-kva., 22,000-volt substation for the Northwest. Another firm reports a steady flow of high-tension fuses of all sizes and states that inquiries are constantly being received.

**Radio.**—Although the summer radio business has slumped, jobbers report an active demand for standard parts. The call for complete sets is sluggish, but stocks are being built up for the fall business. Head telephones and vacuum tubes are now available in better quantities.

**Conduit Boxes.**—An increase of 10 to 20 per cent in the list price of conduit boxes went into effect July 15.

**Lamps.**—Action on lamps of practically all sizes has been sustained, and dealers report active demand by industrials and railroads. Interest in colored lamps is growing.

**Dry Cells.**—Movement on dry cells has changed but slightly, and the No. 6 cell is available at $30.55 per 100 in barrel lots.




VALUATION OF BUILDING PERMITS ISSUED AT AUSTIN, BEAUMONT, DALLAS, EL PASO, FORT WORTH, GALVESTON, HOUSTON, SAN ANTONIO, SHREVEPORT AND WACO 1921 AND 1922

**Sockets.**—Prices on this material are unchanged and the demand has been steady. Stocks are in good condition. The pull chain sockets in 250-box lots sell for $133 per 100 the key for $18.15 per 100, and the keyless for $16.50 per 100, both in lots of 250.

## Boston

### Wiring Materials in Chief Demand—Central-Station Outputs Growing—Traction Earnings Improving

Wiring materials are in chief demand. Increased sales of rubber-covered wire and porcelain are noted. General business continues good and building construction is still gaining. Central-station outputs are growing steadily and traction earnings are improving. Demand for telephone facilities is extraordinary.

**Porcelain.**—"Nail-it" knobs moved Monday at $13.50 per 1,000 in barrel lots. Sales are better than for some time. Tubes are moving well, the 3-in. size selling at $4 per 1,000 in barrel lots. Stocks are ample.

**Flexible Armored Conductor.**—No. 14 single-strip is in active demand, with excellent deliveries. In lots of 1,000 ft., $44.20 per 1,000 ft. in Boston is charged. This material is becoming more popular than rigid conduit in many quarters, owing to the present price.

**Rigid Conduit.**—A price advance of about 4 per cent has gone into effect. In 500-lb. to 5,000-lb. lots, ½-in. black sells at $53.25 per 1,000 ft., galvanized at $58.35. Elbows per 100 in the corresponding lots are quoted at $10.76 for black and $11.90 for galvanized. Black couplings per 100 in lots of 500 lb. to 5,000 lb. are quoted at $5.16, the price for galvanized being $5.58. Deliveries on pipe tend to increase in length.

**Fans.**—A spurt in sales has resulted from warmer weather. Stocks vary a good deal among jobbers.

**Wire.**—Rubber-covered wire is selling fairly well, with good stocks. No. 14 quoted $6.25 per 1,000 ft. in 5,000-ft. lots at Boston Monday. Spasmodic sales of weatherproof wire are a feature of the market, the base being steady at 16.5 cents.

**Motors.**—Scattered orders for smaller-sized units are reported. A good deal of small industrial-plant betterment work is under way, and while sales are not as a rule bunched to make a showing for particular localities, a good many motors are constantly being absorbed for improved machine driving. Prices are steady.

**Radio Equipment.**—Jobbers representing high-grade manufacturers are preparing for an active fall trade. Buying is very conservative as some distributors were heavily overstocked when the summer slump came.

**Fixtures.**—Business is extremely active. All classes of trade are in evi-

dence from office equipment to residences. Considerable industrial lighting betterment work is also under way, but mercantile orders dominate the local market. Prices tend to stiffen somewhat and deliveries are excellent.

## Atlanta

**Metal-Molding Movement Slow—Glass and Porcelain Insulator Demand Is More Active**

**Metal Molding.**—The movement in this line is somewhat slow, though a fairly reasonable volume of sales is still realized. Stocks are in first-class condition, with prices steady and shipments satisfactory.

**Sewing Machines.** — This specialty fails to respond to jobbers' and dealers' efforts to create interest. Unfavorable conditions in the small towns are in a large measure responsible, and little activity can be expected until early fall.

**Washing Machines.**—This line continues slow with only sporadic sales to be noted. Washing machines seem to be suffering from the same malady that affects sewing machines. Dealers' stocks are in splendid shape with no recent price changes recorded.

**Insulators.**—A fair movement in both the glass and porcelain types is to be noted, stimulated somewhat by a slight decrease in price. Most of the shipments in the glass type are going to the rural telephone lines, with the porcelain to larger central stations. Stocks are sufficient and shipments satisfactory.

**Battery-Charging Outfits.**—This specialty has not responded to the pick-up in automobile trade, though it is expected that increased activity will materialize as fall approaches. Radio outfits, however, are responsible for some sales in this line. Stocks are adequate.

**Schedule Material.**—A good movement in this line is reported, building construction which started in the spring now making itself felt. With continued building activity even brisker sales should be the prospect for several months to come. Stocks and shipments are both satisfactory.

**Dry Batteries.**—This item has not responded to the usual summer demand, and few orders are being received. Representative prices in barrel lots are as follows: Regular, $32.72 per 100; igniter, $33.72 per 100. Four-cell units are quoted at $1.78 each.

## St. Louis

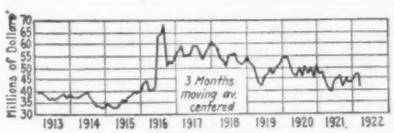
**Line Hardware Prices Advance 5 per Cent—Demand for Wire Reported Increasing**

The principal feature of last week's business was the prevalence of price changes—conduit, porcelain, line hardware, outlet boxes and wire being affected. Little change is noted in the demand for wiring materials and devices and for appliances, but there was a substantial increase in the sale of larger items, such as generators, transformers, motors, motor-generator sets and converters. Stocks continue to be conservatively maintained, and as a result buyers often have to call on several jobbers to get immediate delivery of certain items.

The buying of electrical goods by the railroads has declined slightly, but is still comparatively large, and quite a few large orders from them are pending. Most of the industrials are extremely active, and they are buying probably twice as much electrical equipment as a year ago. Credit conditions show slight improvement. The average time of collections is sixty days, and the long-standing obligations are being liquidated.

The railroad situation has had no material effect on business and shipments are being made as promptly as usual. Reports from the corn districts indicate that agricultural conditions were improved last week by abundant rains.

**Conduit.**—Prices have been advanced, and representative new prices are: ½-in. black, $47.75 per 1,000 ft.; ½-in. galvanized, $54.60 per 1,000 ft.; ¾-in. black, $60.60 per 1,000 ft. ¾-in. galvanized, $68.25 per 1,000 ft. Demand continues to improve, and stocks are larger.




THE TREND OF DIVIDEND PAYMENTS BY INDUSTRIAL CORPORATIONS

**Porcelain.**—Heavy reductions are being made. "Nail-it" knobs have declined from $15 per 1,000 in barrel lots to $12.75 per 1,000. Similarly, two-wire and three-wire unglazed cleats have fallen from $10.70 per 1,000 to $8.25 per 1,000, 2½-in. tubes from $3.73 per 1,000 to $3.35 per 1,000, 3-in. tubes from $4.50 per 1,000 to $3.75 per 1,000, 4-in. tubes from $5.50 per 1,000 to $4.95 per 1,000, and No. 5½ split knobs from $10.70 per 1,000 to $8.25 per 1,000. Stocks are not heavier than the demand requires.

**Line Hardware.**—A 5 per cent advance in prices is announced. Sales are irregular but show improvement.

**Outlet Boxes.**—New list prices are being established to eliminate irregular differentials which existed between the various sizes, and the resultant average prices will be slightly advanced.

**Wire.**—There is some tendency to stiffen prices as demand increases. One jobber reports the sale of 50,000 lb. of weatherproof last week. No. 14 rubber-covered is quoted at $6.50 per 1,000-ft. in 1,000-ft. lots. The base on both bare and weatherproof is around 17 cents per pound.

## San Francisco

**Fan Demand Excellent—Lamp Stocks Reduced—Range Competition Keen**

The value of building permits for June, 1922, was: Los Angeles, $10,652,265; San Francisco, $3,336,901; Oakland, $3,318,085, and San Diego, $1,010,362. The value for June, 1921, was: Los Angeles, $6,269,546; San Francisco, $950,965; Oakland, $1,486,022; San Diego, $799,944.

**Fans.**—Unusually hot weather in interior valleys has resulted in excellent business, and local stocks may not last out the year.

**Lamps.**—Dealers' stocks have been reduced nicely, and while adequate are probably better proportioned than for years. This season, of course, is comparatively quiet, but has held up surprisingly.

**Fixtures.** — Big jobs approaching completion are demanding big shipments. Metal reflectors are moving very well. In fact, industrial building is an ever-increasing item. Residence fixtures of the better known sort are moving fairly well but are not getting a proper share in the accelerated residence building. Cheap fixtures predominate there, the final decision passing out of the hands of the architect and owner into those of the tract manager, who, of course, desires low first costs.

**Schedule Material.**—The same lamentable situation applies here. However, industrial and office building keeps schedule business at a high, well-proportioned level, shipments of 100,000 lots from the East to local warehouses being not uncommon.

**Ranges.**—Prices appear on the up grade, although dealers are not getting the profit rate of a year or so ago. Power companies are consolidating effective sales forces and report gratifying results. Exceedingly keen competition prevails among range manufacturers.

## Salt Lake City–Denver

**Leading Jobbers Plan to Offset Buying of Cheap Material by Extensive Advertising**

Home building is progressing at an unprecedented rate in all towns and cities of importance. Electrical dealers are alert to the opportunity to wire for an ample number of convenience outlets. There is some tendency to use cheap materials in order to obtain contracts or to cut down the number of outlets adequate for complete electrical service. Some of the leading jobbing concerns plan to offset this by vigorously advertising to builders and home owners the advantage of using standard materials and specifying plenty of convenience outlets.

Interest in radio seems to be waning. It is believed, however, that the interest will revive at the close of the summer season. Just now people are not spending their evenings at home,

and this is thought to have a depressing effect on the radio market. Despite a good fan season, so far as weather is concerned, some jobbers are expressing disappointment at the volume of business. It looks as if considerable stock will be held over to another season.

## Portland–Seattle

**Conduit Stocks Slow—Fan Demand Is Good—High-Tension Insulator Market Active**

One jobber estimates that his July sales will be from 125 to 150 per cent better than a year ago. The electrifying of sawmills has offered a good market for electrical supplies and equipment, and this market will grow even better as conditions in the lumber industry improve. Stocks are in good condition.

**Conduit.**—An advance of from 3 to 5 per cent in the price of rigid conduit became effective last week. The demand is good and stocks in Seattle are low.

**Fans.**—Owing to the comparatively short hot period in the summers in the Northwest, fans do not as a rule move in very large quantities. This year, however, owing to a very long, hot dry spell during the months of May and June and continuing so far in July, fans have been quite active, and it is reported that May and June sales were greater than for the entire season last year.

**Insulators.**—The demand for high-tension insulators throughout the Northwest this year has been greater by far than for a good many years past. This is due to the large number of transmission lines under construction.

# Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

### New England Central Station Sold $112,359 of Appliances

Gross appliance sales in a New England central station serving 38,649 meters in 1921 totaled $112,359, yielding an estimated service income to the company of $24,085 per year. The total number of appliance units sold was 8,114, and these represented a connected load of 2,557 kw. Of the standard appliances sold the following totals were recorded: Automobile heaters, 10; chafing dishes, 6; vacuum cleaners, 1,042; curling irons, 176; fans, 162; flatirons, 3,793; heating pads, 159; immersion heaters, 14; ironers, 1; radiant heaters, 108; sewing-machine motors, 43; percolators, 144; portable lamps, 1,113; ranges, 19; sewing machines, 53; table stoves, 97; toasters, 395; vibrators, 9; water cups, 22; washers, 86; waffle irons, 31. The population served is about 175,000.

### Industrial Electric Company Awarded Large Contract

The Industrial Electric Company of Dallas, Tex., has received a contract for installing electric equipment for the American Ice Company of Dallas and the Darco Corporation of Marshall, Tex. The plant of the American Ice Company, it is declared, will be one of the most modern in the entire country. The entire installation of ice machinery, compressors and auxiliaries is directly driven. There are two 100-hp., 4,160-volt, 164 r.p.m. Westinghouse synchronous motors directly coupled to 35-ton York ammonia compressors. In addition to these two large motors, there is approximately 100 hp. in small motors. Power for the installation is furnished by the Dallas Power & Light Company and distributed to the various motors, auxiliaries and transformers through a Westinghouse switchboard with overload protection and low-voltage release instruments.

### General Electric Company Starts Home Wiring Sales Campaign

National advertising to reach the ultimate consumer, the home builder and owner, with the advantages of complete and adequate wiring for homes, rather than the promotion of individual wiring devices, is the keynote of a particularly interesting sales plant just started by the General Electric Company. The general advertising offers as a special feature a booklet entitled "The Home of a Hundred Comforts," which explains the comfort and convenience of completely wired homes.

The various wiring features of each room, the switches, outlets, etc., are pointed out, and just what they mean in terms of convenience and service is explained. The story is told in non-technical language, wholly understandable by the person who knows nothing about the electrical or mechanical features of house wiring. The man whose house, built some time ago, is inadequately wired is assured that it can be brought up to date in this respect without defacing the walls and at comparatively small expense.

Instead of referring the contractors to the inquirers who may write for the booklet, as has been customary in campaigns of this nature, the person writing for the information will be referred directly to the contractor-dealers in his vicinity and invited to discuss his problems personally with such contractors.

### U. S. Electrical Manufacturing Company Erecting $500,000 Factory

Having broken ground on May 20 last for what it is declared will be the largest electrical factory west of the Mississippi River, the Austin Company, contractor, is rushing the erection of a new factory for the U. S. Electrical Manufacturing Company, Los Angeles. The factory is situated on a tract of land 5¼ acres in size and will be one of the most modern industrial units in southern California. It is stated that the plant and equipment will represent an investment of approximately $500,000.

The tract recently purchased by the company faces on Slauson Avenue and occupies an entire block between Los Angeles and Wall Streets. There is a frontage of 343 ft. on Slauson Avenue and the plot extends 970 ft. southward. The building for the first unit will occupy two acres of space and will be one of the largest daylight factories in the West. It will be constructed of steel and ornamental brick with the entire sides of glass. Several thousand dollars has been appropriated for the gardening features alone.

The first unit, which will have a frontage of 150 ft. will be two stories high and will furnish a space of 4,000 sq.ft. for administration, engineering and drafting accommodations. In the factory building proper special runways for electrical cranes and monorails are to be installed, and the production machinery will comprise seventy-five individual motor-driven machine tools, including not only the equipment at the company's present plant at Third and Central Avenues but many other machines that are being built for its special purposes.

Ample ground has been purchased to permit expansion for several years to come, and the new plant is designed to double the company's present production of electric motors. During the past twelve months the sales volume of this company has increased 250 per cent. Officials of the company state that the production could have been greater had the present facilities of the factory made it possible to take care of the heavy spring business, particularly the demand for irrigation motors.

### U. S. Light & Heat Corporation of California Organized

The U. S. Light & Heat Corporation of California has been organized and incorporated as a subsidiary of the U. S. Light & Heat Corporation of Niagara Falls, N. Y., manufacturers of USL storage batteries, railroad-car lighting devices and electric arc welders.

A site has been leased by this company and construction started on a new plant in Oakland, Cal. The purpose of this new plant is to enable the U. S. Light & Heat Corporation to handle more efficiently its growing volume of

business on the Pacific Coast. It is anticipated that construction will start in the new factory about Oct. 1.

## Hygrade Lamp Company Addition to Be Finished in August

The new four-story, 50 x 110 ft. addition to the plant of the Hygrade Lamp Company of Salem, Mass., will be completed early in August, officials of that company have announced. The complete plant will have over 105,000 sq.ft. of connected floor space and a capacity of 30,000 lamps a day.

## Westinghouse Gets Interesting Order from a Large Pulp and Paper Corporation

The Westinghouse Electric & Manufacturing Company has received an interesting order from the Washington Pulp & Paper Corporation, Port Angeles, Wash.

The order includes one complete sectional individual motor drive for a 164-in. Bagley-Sewell Foudrinier newsprint paper machine for paper production speeds of 400 ft. to 1,200 ft. per minute, including a 600-kw. synchronous-motor generator set; nine section motors and gear units and control equipment; three 1,000-hp., 240-r.p.m. synchronous motors for driving pulp grinders; one 200-kw. synchronous-motor exciter set for pulp-grinder motors; one 3,330-kva., 360-r.p.m. vertical waterwheel-type generator with direct-connected exciter, and one 2,500-kva., 120-r.p.m. engine-type alternating-current generator.

The apparatus ordered from the Westinghouse company will be used for increasing the capacity of the plant, which was built four years ago and is one of the most modern on the Pacific Coast.

**The General Electric Company** has announced the formation of a merchandise department which will have charge of products that are handled through resale channels. The organization will consist of three divisions: Administrative, supply sales and motor sales, and will be headed by George P. Baldwin as general merchandise manager and H. C. Houck as assistant general merchandise manager.

**The Federal Electric & Manufacturing Company**, Chartiers Street, Pittsburgh, Pa., manufacturer of electric switches, etc., has acquired a four-story factory at McKees Rocks, Pa., for a consideration of $60,000 and will occupy the entire building.

**Stockholders of the Volta Battery Company**, 205 North Delaware Street, Indianapolis, Ind., manufacturer of electric batteries for automobile service, are arranging to purchase the plant and property from the receiver. A new company will be organized to operate the plant, and a number of improvements will be made. L. W. Jenkins, one of the principal stockholders, will be active in the new organization.

**The Western Radio Sales Company** has opened offices in the McIntyre Building, Salt Lake City, Utah. This company will handle products of the Radio Corporation of America, together with Westinghouse and General Electric equipment. The company also maintains offices at Ogden, Butte, Mont., Reno, Nev., Boise, Idaho, Denver, Col., and Cheyenne, Wyo.

**The Standard Underground Cable Company's** new St. Louis plant has been held up by strikes in the building trades, but the men are now ordered back to work, and it is expected that the plant will be producing cable in the next few months.

**The Electrical Engineering & Manufacturing Company**, Pittsburgh, has opened offices in the Mercantile Library Building, Cincinnati, Ohio. Mr. A. A. Morton, formerly with the Westinghouse Electric & Manufacturing Company's Pittsburgh office, is in charge as district manager.

**The city of Superior, Neb.**, has negotiations under way with the Southern Nebraska Power Company, Superior, Neb., for furnishing electrical current for street lighting. L. P. Gregory, city clerk, and the Hollister Engineering Company, Bankers' Life Building, Lincoln, Neb., are conducting the negotiations.

**The Kenney Electric Company**, New London, Conn., recently incorporated under the laws of that state to manufacture electric devices, organized the past week and elected the following officers: President, Samuel Camputt; vice-president, William Weiner; vice-president, Samuel Gipstein; treasurer, Richard Hendel, and secretary Joseph Schwartz.

**The Century Electric Company**, manufacturer of alternating-current motors and fans, is building additions and improvements to its plant at 113 North Eighteenth Street, St. Louis, to cost approximately $100,000.

**The Okonite Company**, Passaic, N. J., manufacturer of Okonite insulated wires and cables, splicing tapes, etc., has recently opened a branch office in San Francisco, Cal., at 509 New Call Building. S. Herbert Lanyon is manager.

**The Johns-Pratt Company** of Hartford, Conn., whose selling arrangements through the Johns-Manville Company were recently dissolved, has established a Pacific Coast branch of its own. This office, located in the Call Building, New Montgomery Street, San Francisco, will be in charge of A. J. Moan.

**The Electric Power Club** will, effective Aug. 1, move its offices from St. Louis to the Kirby Building, Cleveland, according to S. N. Clarkson, its secretary. The new location was adopted because it is more centrally situated. The fall meeting of the club is announced for the week of Oct. 30 and will be held at Grove Park Inn, Asheville, N. C.

**J. V. Wallace**, for more than twenty years in charge of the second-hand apparatus department of the General Electric Company, announces that he has organized the J. V. Wallace Company, Inc., with offices in the Wedgeway Building, Schenectady, N. Y., to buy and sell new and used motors, generators, turbines, engine sets and power machinery.

**Cincinnati**, through its local electrical contractors' committee and with the cooperation of the Chamber of Commerce, is making elaborate arrangements to entertain the visitors to the annual convention of the National Electrical Contractors' Association, to be held in that city from Oct. 11 to 14.

**The Edison Lamp Works of the General Electric Company**, Harrison, N. J., has acquired a tract of about 175 acres of land at Parsippanny, N. J., to be used for future expansion.

**R. M. Owen** and associates have acquired the plant and property of the Dyneto Electric Corporation, Syracuse, N. Y., manufacturer of electric starting and lighting systems for automotive service. A consideration of $205,000 was given. The plant was sold for the benefit of creditors. The new owners propose to reorganize the company and resume operations at an early date.

**The Pittsburgh Gage & Supply Company**, Pittsburgh, Pa., manufacturer of electrically operated washing and ironing machines, etc., is disposing of a bond issue of $600,000, a portion of the proceeds to be used for expansion, liquidation of current indebtedness and for additional working capital.

**The Commercial Electric Manufacturing Company**, Pittsburgh, Pa., is being organized by Russel F. Clarke, James M. and Samuel M. Miller to manufacture electrical equipment and devices. The company is represented by J. M. Redden, 503 Farmers' Bank Building.

**The Safety Car Heating & Equipment Company**, Dixwell Avenue, New Haven, Conn., manufacturers of electric lighting and heating equipment, is completing plans for two plant additions, each one-story, 100 ft. x 194 ft. and 106 ft. x 115 ft. respectively, to be used for battery-plate manufacture and other production. Stovel & Brinkerhoff, 136 Liberty Street, New York, are engineers and contractors.

**The Pennsylvania Power & Light Company**, Allentown, Pa., has acquired a building at Hazelton, Pa., with adjoining property, for a consideration of $77,000, for the centralization of its offices and equipment department.

**The Plainville Electric Products Company**, Plainville, Conn., recently incorporated under the laws of Connecticut to manufacture electrical products, parts, supplies, etc., organized last week and elected the following officers: President, F. L. Benzon; secretary and treasurer, Donald Benjamin. Directors include Messrs. Benzon and Benjamin, and H. E. Smith. The plant of the company is on Whiting Street, Plainville.

## Foreign Trade Notes

THE ERECTION OF A NEW POWER STATION IN SYDNEY, AUSTRALIA, TO BE POSTPONED.—The Sydney Electricity Committee, according to the *Electrician*, has decided to postpone the erection of a new power station and to enter into negotiations with the Railway Commissioners for furnishing electricity in bulk. A new power house would cost from £1,000,000 to £1,250,000 and would have to be ready in five years time, but the Commissioners can furnish a supply whenever it is required. Nearly £5,000,000 has already been expended on the undertaking.

NEW ELECTRIC PLANT IN SYRIA.—Through the American Consul at Damascus, *Commerce Reports* states, an opportunity is presented to American manufacturers to bid on a proposed electric lighting installation at Homs, Syria. The work is to be done in connection with the French Delegation at Damascus. The name of the adviser for public works of the French delegation, who can furnish information regarding the proposition, may be obtained from the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, Washington, D. C., or any of the bureau's district offices by referring to Exhibit No. 59,318.

NEW TELEPHONE SYSTEM CONTEMPLATED FOR ESTHONIA—The installation of a new telephone system, including a new central plant, George Gregg Fuller, a vice-consul at Reval, reports, is under consideration. The present plans provide for a switchboard of 25,000 lines.

EXPANSION OF THE UNION MINIÈRE DU HAUT-KATANGA.—By a royal decree dated Jan. 14, 1922, the duration of the Société Union Minière du Haut-Katanga (Belgian Kongo) was extended to March 11, 1990, as were also the concessions made to it under Articles 1 and 2 of the convention of Oct. 30, 1906. The purpose of this action was to permit the Union Minière to obtain the resources necessary to treat mineral (copper) by electrochemical process, the application of which necessitates the harnessing of important hydraulic forces and the erection of appropriate plants. It is stated that 300,000,000 francs will be expended for the above project.

## Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired by a merchant in Italy (No. 2,883) for the sale of electric motors and electrical supplies.

A commercial agent in Australia (No. 2,886) desires to secure an exclusive agency for the sale of improved telephone devices, etc.

An industrial organization in Greece (No. 2,894) desires to secure an agency and an exhibition of products for demonstration purposes, such as those pertaining to public works, hydro-electric schemes, cold-storage installations, waterworks, etc.

A merchant in England (No. 2,917) desires to purchase spraying syringes in brass and copper for use in factories, public buildings and theaters; ear, dental and nasal syringes, electrical syringes, electrical floor polishers, etc.

PROPOSED HYDRO-ELECTRIC PLANTS IN CZECHOSLOVAKIA.—Tenders are now being asked, according to the *Electrical Review*, for equipment for the new power station which is to be erected by the Zentral Elektricitätswerke Aktien Gesellschaft at Seestadtl, near Komotau, Czechoslovakia, with financial aid of the provincial administration. The province has agreed to guarantee a loan of 25,000,000 Czech kronen, to be later raised to 38,000,000 kronen. A Franco-Swiss company has been organized, the *Electrical Review* states, to develop a hydro-electric plant on the Rama River, near Jablonica, to supply electricity in the towns of Konji and Prozor, to the Metkovic-Mostar-Sarajevo railway, to the proposed railway from Konjic to Dubrovnik, and also to various industries. The initial installation will have a capacity of 40,000 hp., later to be increased to 63,000 hp. The cost of the project is estimated at 11,000,000 kronen.

ELECTRIC EQUIPMENT FOR NEW ZEALAND.—Tenders will be received by the Southland Electric Power Board, Wellington, New Zealand, until Sept. 30, according to the *Electrician*, for electric equipment as follows: (Section A) Distribution transformers; (B) bare and insulated cables and joining sleeves; (C) lightning arresters and choke coils; (D) pole-type switches; (E) pole-type fuse supports and fuses; (F) line insulators; (G) pole ironwork (bolts, pole steps, coach screws, hookhead); (H) service meters, testing meters and service fuses.

INSULATORS FOR MORWELL POWER SCHEME, AUSTRALIA.—Tenders are invited by the State Electricity Commission of Victoria, Australia, until Sept. 16, the *Electrical Times* states, for strain and pin type insulators (specification No. 261) for the Morwell power scheme. Further information may be obtained on application to the Agent General for Victoria, Melbourne Place, Strand, London, W. C. 2.

## New Apparatus and Publications

TAPING MACHINE EQUIPMENT.—P. E. Chapman Electrical Works, St. Louis, has developed a motor-driven taping-machine equipment, consisting of an armature or field taping machine directly belted to a low-speed motor.

ELECTRIC VEHICLES.—The Edison Storage Battery Company, Orange, N. J., in a bulletin entitled "Haulage and Delivery," describes the electric vehicle system for bakers. This bulletin is the first of a series on electric delivery service in various industries.

BALANCING MACHINES, EXTENSOMETERS AND STRAIN GAGES.—The Tinius Olsen Testing Machine Company, 500 North Twelfth Street, Philadelphia, is distributing a circular covering the "Olsen-Carwen" static-dynamic balancing machines, "extensometers" and strain gages. Bulletin No. 3 issued by the company covers its transverse and beam-testing machines.

ACORNS.—Bulletin No. 17-13 distributed by Harvey Hubbell, Inc., Bridgeport, Conn., describes the "Hubbell" luminous (detachable) acorns.

DESK LAMPS.—A new line of desk lamps has been developed by S. Robert Schwartz & Brother, 729 Broadway, New York City, manufacturers of the "Esrobert" adjustable lamps.

LIGHTING DATA.—The Edison Lamp Works of General Electric Company, Harrison, N. J., is distributing bulletins L. D. 102A, L. D. 138 and L. D. 139, entitled "Effect of Walls and Ceilings on Resultant Illumination," "Fundamentals of Projection" and "The Lighting of Small Stores" respectively.

BATTERY RECHARGER.—The King Electric Manufacturing Company, Inc., Tonawanda, N. Y., has recently developed a new radio battery recharger "A," designed for use with parlor sets.

STEAM TURBINES.—The De Laval Steam Turbine Company, Trenton, N. J., has issued a sixteen-page catalog describing the "De Laval" velocity stage steam turbines designed to be directly coupled to high-speed centrifugal pumps, small generators, etc.

## New Incorporations

THE DUNLAP (ILL.) LIGHT & POWER COMPANY has been organized to operate an electric lighting and power system in Alta, Dunlap and the surrounding district. The officers are: J. H. Sheehan, president; J. Steigele, treasurer, and C. E. Hitchcock, secretary.

THE CARROLL COUNTY ELECTRIC COMPANY, Carrollton Mo., has been organized to take over the property of the Water, Light & Transit Company of Carrollton. The incorporators are Hugh C. Blackwell, Harley C. Davis and Herbert A. Spokesfield, all of Kansas City.

THE ROCK LIGHT & POWER COMPANY, Crosbyton, Tex., has been incorporated by S. A. Guy, J. C. Orr and F. H. Wheat. The company is capitalized at $40,000.

THE HAMPDEN & NEWBURG LIGHT & POWER COMPANY, Hampden, Me., has been organized with a capital stock of $50,000 to generate and distribute electricity. The officers are: C. A. Nason, president; E. L. Hammond, treasurer, and R. L. Smith, clerk.

# Construction News

**Projects, Plans, Bids and Contracts, Contemplated or Under Way**

## New England States

PEJEPSCOT, ME.—Tentative plans have been prepared by the Pejepscot Paper Company, Brunswick, for the erection of an addition to its local plant, to cost with machinery, power equipment, etc., about $1,000,000.

MONTPELIER, VT.—Arrangements have been completed by the Montpelier & Barre Light & Power Company for extending its system to the village of Warren. The transmission line will be extended from Waitsfield to Warren to supply the service. Plans have been completed for extensions to the service in Waterbury Center.

BOSTON, MASS.—Ornamental lamps will be installed on Boylston Street from Tremont Street to Copley Square.

BOSTON, MASS.—The Edison Electric Illuminating Company has awarded a general contract to George B. H. Macomber, 44 Bromfield Street, for the erection of a two-story addition to its power house at 256-274 Broadway.

NEW BEDFORD, MASS.—The Public Utilities Commission has granted the New Bedford Gas & Electric Light Company permission to issue $1,144,800 (par value) in capital stock, the proceeds to be used for extensions and improvements, including the installation of a 20,000-kw. generating unit (for which contract has been placed) and the erection of a high-tension transmission line to connect with the system of the Fall River Electric Light Company.

WESTFIELD, MASS.—Extensions of the electric lighting system to East Mountain, the brickyards and upper Western Avenue sections is under consideration by the Municipal Light Commission.

PROVIDENCE, R. I.—The construction of a new car barn and shop, to cost about $60,000, is under consideration by the United Electric Railways Company.

DANBURY, CONN.—The Danbury & Bethel Railway Company has entered into a contract with the Danbury & Bethel Gas & Electric Light Company for electricity to operate its system during the summer months. A number of changes and repairs will be made to the power plant of the street railway company.

HARTFORD, CONN.—Complete mechanical laboratories, machine shop and other manual training departments will be installed in the new Thomas Snell Weaver High School. The entire cost is estimated at $1,250,000.

## Middle Atlantic States

MALONE, N. Y.—The Northern Light & Power Company, Inc., Malone, recently incorporated, is planning to construct another water-power development on the Salmon River, near Malone, where the Malone Light & Power Company has a large generating station. The Northern company has petitioned the Public Service Commission for permission to acquire the property of the Malone Light & Power Company and the Sulham Manufacturing Company. M. S. Wilder is president.

NEWBURGH, N. Y.—A power house will be erected in connection with the new local factory of the American Chocolate Products Company, 158 Broadway, New York, to cost $350,000. Andrews, Tower & Lavalle, 21 East Fortieth Street, New York, are engineers.

NEWBURGH, N. Y.—Arrangements have been made for the installation of electric lighting systems in the villages of Wingdale, Dover Plains, Wassaic, Amenia and surrounding hamlets. Electricity will be supplied from the Bulls Bridge plant. To meet the cost of construction, which is estimated at $120,000, the following amounts have been apportioned to the various towns: Wingdale, $20,000; Dover Plains, $35,000; Amenia and surrounding hamlets, $69,000.

NEW YORK, N. Y.—The New York Edison Company contemplates the erection of a transformer station at 12 Stone Street,

to cost about $90,000. W. Whitehill, 709 Sixth Avenue, is engineer.

NEW YORK, N. Y.—A new two-story power house, 48 ft. x 68 ft., will be erected at the New York Homeopathic Medical College and Flower Hospital, Avenue A, Sixty-third to Sixty-fourth Street. Francis T. Joanes, 16 East Fortieth Street, is architect.

ROME, N. Y.—Bids will be received by Cyrus J. Severance, president board of managers, State School for Mental Defectives, Rome, until Aug. 7 for engines and direct-current generators (for lighting purposes) at the above institution.

VINELAND, N. J.—The Vineland Hospital Association will build a power house, 43 ft. x 60 ft., at the proposed Newcomb Hospital, to cost $150,000. Stearns & Woodnutt, Stephen Girard Building, Philadelphia, are engineers.

ALLENTOWN, PA.—The Jordon Electric Company is being organized by Elmer Bachman and D. S. Martin to construct and operate an electric plant in Hidelberg Township. Silas R. Rothermel, Allentown, represents the company.

CHESTER, PA.—The Delaware County Electric Company will increase its capital from $12,800,000 to $15,000,000, part of the proceeds to be used for extensions and improvements.

CRESSON, PA.—The Cresson Township Power Company has been organized to operate a local plant by C. A. McClure and F. W. Woodcock. James Collins Jones, Bullitt Building, Philadelphia, is representative.

EASTON, PA.—The Pennsylvania Edison Company has issued $57,000 in bonds, part of the proceeds to be used for extensions and improvements.

HOLTWOOD, PA. — The Pennsylvania Water & Power Company has issued $850,000 in bonds, part of the proceeds to be used for extensions and improvements.

PENNSBURG, PA.—The construction of a boiler house and the installation of new boilers at the municipal electric light plant is under consideration.

PHILADELPHIA, PA.—The Philadelphia Electric Company has increased its capital stock from $60,000,000 to $67,085,000. Work will be commenced at once on a new power house on Race Street, to cost $70,000, and an addition to the Franklin power house, Sixth Street. It will erect also a new power plant at American and Susquehanna Avenues.

PHILADELPHIA, PA. — The Excelsior Electric Light, Power & Gas Company, 834 Land Title Building, has been organized to take over a number of companies, including the West Rockhill (Pa.) Township Electric Light & Power Company and the East Rockhill (Pa.) Township Electric Light & Power Company. Daniel W. Simkins is secretary.

PHILADELPHIA, PA.—The Philadelphia Electric Company has contracted with the West Jersey & Seashore Railroad, Camden, for electricity to operate its third-rail system between Camden and Atlantic City. A transmission line will be erected to Westville via Bridesburg and Delair, where connection will be made with the West Jersey lines. The power plant at Westville, N. J., will be closed down.

PITTSBURGH, PA. — Officials of the West Penn Company are organizing the West Penn-Monongahela Company to take over the plant and system of the Monongahela Power & Railway Company. Extensions will be made to the system.

SCRANTON, PA.—Plans are being prepared by the Scranton Lace Company for the erection of a one-story power house on Albright Avenue, to cost about $150,000. Lockwood, Greene & Company, 101 Park Avenue, New York, are engineers.

SUNBURY, PA.—Extensions will be made to the ornamental lighting system in the business district.

WILMERDING, PA.—The United Electric Light Company has applied to the Public Service Commission for permission to operate a lighting system in North Versailles.

DOVER, DEL.—The Wilmington Traction Company contemplates the erection of a transmission line on the Kennett Pike.

BALTIMORE, MD. — The Consolidated Gas, Electric Light & Power Company will soon take bids for the construction of an addition to its substation at 6-8 McClellan Street, to cost about $30,000.

BALTIMORE, MD. — Preparations are being made by the Western Maryland Railroad Company for extensions to its grain elevator plant at Port Covington, including the installation of mechanical and operating machinery to increase the capacity to 2,000,000 bushels. Work has begun on the foundation for a new locomotive and car repair shop, to cost about $50,000.

FRANKLIN, W. VA.—M. S. Hodges is reported to be interested in the construction of a hydro-electric plant on the south branch of the Potomac River.

HAMPTON ROADS, VA.—Bids will be received by the Bureau of Yards and Docks, Washington, D. C., until July 26 for coal and ash handling equipment at the local naval base. (Specification No. 4,667.)

WASHINGTON, D. C.—The District of Columbia Paper Company, Water Street, will begin work at once on a hydro-electric power plant, to cost about $50,000.

WASHINGTON, D. C.—Bids will be received by the Chief of Engineers, United States Army, Munitions Building, Room 2,060, until Aug. 1 for ten Diesel-engine generating sets, 90 kw. and 125 volts, and switchboards (Adv. 91). Also for four motor-driven air compressors (Adv. 90).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies & Accounts, Navy Department, until Aug. 8 for electric wire for various navy yards, as follows: 13,800 ft. lighting and power wire; 11,000 ft. lighting and power wire, 1,300 ft. cable; 23,500 ft. incandescent lamp cord; and 2,500 ft. lighting and power wire (Schedule 51). Also, on the same date, for 44,000 ft. bell wire; 36,500 ft. bell wire; 83,000 ft. double-conductor wire; 171,000 ft. double-conductor wire; 4,300 ft., 3,600 ft., 19,000 ft. and 40,000 ft. lighting and power wire; 1,000 ft. interior communicating cable; and 2,500 ft. single-conductor ignition cable (Schedule 52).

## North Central States

ESSEXVILLE, MICH.—The Aetna Portland Cement Company, 412 Union Trust Building, Detroit, will build a power plant in connection with its new local cement mill, to cost about $1,000,000.

INDIANAPOLIS, IND.—Bids will be received by the Board of Sanitary Commissioners, Sanitary District of Indianapolis, City Hall, until July 31 for construction of section 2 of division 111 and furnishing and erecting mechanical equipment for sewage-disposal plant, including construction of power-plant building, electric power-plant crane and five electrically driven centrifugal pumping units. Charles H. Hurd, Merchants' Bank Building, is consulting engineer.

JACKSONVILLE, IND. — The power house and other mechanical departments at the property of the Green Valley Coal Mining Company were recently destroyed by fire, causing a loss of about $50,000.

MICHIGAN CITY, IND.—The electrically operated pumping plant at the municipal water works, recently destroyed by fire, will be rebuilt at once. The loss, including machinery, is estimated at $500,000.

PENDLETON, IND.—A power plant will be erected at the new Indiana State Reformatory to be erected in Pendleton, to cost about $3,000,000. Herbert Foltz, Indianapolis, is architect.

TERRE HAUTE, IND.—Plans are being prepared for the installation of an underground fire-alarm system in the business district. Harry Bledso is fire superintendent.

CHICAGO, ILL.—Work will soon begin on the installation of 54,000 additional street lamps in the city, for which $2,000,000 in bonds was recently voted.

DUNLAP, ILL.—Arrangements are being made to erect a transmission line to supply electricity in Alta, Dunlap and farms in this district from the substation of the Central Illinois Light Company in Peoria Heights. The Dunlap Light & Power Company, recently organized, will furnish the service. J. H. Sheehan is president of the company.

MATTOON, ILL. — The Central Illinois Public Service Company has petitioned the Public Service Commission for permission to erect an electric transmission line between Pawnee and Springfield.

SHELBYVILLE, ILL.—The City Council has approved a resolution providing for the sale of the municipal electric light plant and issuing certificates of indebtedness for $100,000 for the construction of a new electric plant.

WAUKEGAN, ILL.—An electrically operated pumping plant will be installed in connection with a new filtration plant at the municipal waterworks, to cost about $900,000. Hoad, Decker & Druary, Ann Arbor, Mich., are engineers.

WAUKEGAN, ILL.—The Public Service Company of Northern Illinois, 72 West Adams Street, Chicago, Ill., will take bids about July 24 for the first unit of its proposed power plant on Greenwood Avenue, to cost about $1,000,000.

BARABOO, WIS.—Plans are under consideration by the G. McCarthen Company for the construction of a hydro-electric plant, to cost about $45,000.

BELOIT, WIS.—The P. B. Yates Machine Company, 729 Fourth Street, contemplates rebuilding its power house and installing a 1,000-kw. generating unit.

HAWKINS, WIS.—F. Prochaski of Milan is planning to erect an electric light plant in Hawkins, to cost about $60,000.

CLEARWATER, MINN.—The St. Cloud Power Company has been granted permission by the Federal Power Commission to build a hydro-electric plant to develop about 4,500 hp.

MINNEAPOLIS, MINN.—The Northern States Power Company has issued $2,000,000 in bonds, part of the proceeds to be used for extensions and improvements. Permission has been secured from the Federal Power Commission to build hydro-electric plants at Otsego and Monticello, on the Mississippi River, to develop a total of 10,300 hp.

BOONE, IA.—The Iowa Traction Company, Cedar Rapids, is making surveys for a hydro-electric plant on the Des Moines River, near Boone. J. D. Wardle, Cedar Rapids, is engineer.

CARROLLTON, MO.—The Carroll County Power Company, recently organized, has petitioned the Public Service Commission for permission to acquire and operate the property of the Water, Light & Transit Company, Carrollton, and to erect a transmission line from the plant of the Kansas City Power & Light Company to Carrollton.

DONIPHAN, MO. — Samuel Danner is reported to be considering the construction of light, power and ice plants.

GRANT CITY, MO.—The Maryville (Mo.) Electric Light & Power Company contemplates the erection of a transmission line to Grant City, Sheridan and vicinity.

JOPLIN, MO.—The Empire District Electric Company will enlarge its power plant and make extensions to its transmission and distributing system. A 10,000-kw. generator will be installed.

KANSAS CITY, MO.—A power house will be erected at the City Hospital, 23 ft. x 40 ft., at Twenty-third and Cherry Streets. M. K. Robertson is secretary of hospital and health board.

MARYVILLE, MO.—The Maryville Electric Light & Power Company contemplates erecting transmission lines to Grant City, Parnell, Sheridan and Worth.

SEDALIA, MO.—The City Light & Traction Company contemplates building a new power house, to cost with equipment, about $360,000.

WEST PLAINS, MO.—The Federal Power Commission has granted the Dixie Power Company permission to construct a hydro-electric plant on the White River at the mouth of Buffalo River. The company also contemplates building a dam on North Fork River, near West Plains.

COLOME, S. D.—The local electric plant has been purchased by the Tri-State Utilities Company, Eldorado, Iowa. Service hereafter will be supplied from the Winner (S. D.) plant of the company.

PICKERELL, NEB.—Bonds to the amount of $12,000 have been voted for a municipal electric lighting system and the erection of a transmission line to connect with the lines of the plant at Beatrice.

BLUE RAPIDS, KAN. — The Marshall County Power & Light Company has petitioned the Public Utilities Commission for permission to distribute electricity for lamps and motors in the towns of Centralia, Corning and Goff. The company is planning to take over the contracts and service of the municipal electric plant, which has been supplying service in these three towns.

## Southern States

CHINA GROVE, N. C.—The China Grove Cotton Mills, Inc., will install an electric power plant and system in connection with its new local yarn mill. A. C. Lineberger, Belmont, is president.

ELIZABETH CITY, N. C.—The Council is considering building an electric light plant and waterworks or purchasing the local systems.

KINSTON, N. C.—The installation of ornamental lamps on Queen, Heritage and other streets is under consideration.

DENMARK, S. C.—J. B. Guess, Jr., R. A. Easterling and others are interested in a hydro-electric project on the Edisto River, 4 miles from Denmark, which will be oper-

ated in connection with the present local steam plant. It is proposed to develop 500 hp.

VALDOSTA, GA.—The electrically operated pumping plant at the waterworks, recently destroyed by fire, will be rebuilt. The loss is estimated at about $30,000.

BENTON, ALA.—The power house, sawmill and other portions of the plant of the Ward Lumber Syndicate were recently damaged by fire, causing a loss of about $100,000.

GREENSBORO, ALA.—The Greensboro Water Company, Birmingham, recently organized, has petitioned the Public Service Commission for permission to acquire the light and water plants at Greensboro and operate same.

MONTGOMERY, ALA.—The Atlantic Ice & Cold Storage Corporation contemplates extensions to its ice-manufacturing and cold storage plant, to cost, including machinery, about $300,000.

NEW ORLEANS, LA. — Contract has been awarded by the Consumers' Light & Power Company for the construction of a building at 409 Tchoupitoulas Street for a power plant.

POCAHONTAS, ARK. — The Central Power & Light Company has increased its capital stock from $2,500,000 to $5,000,000, part of the proceeds to be used for extensions and improvements.

OILTON, OKLA.—The Oklahoma Gas & Electric Company will build a transmission line to connect its local property with its main transmission system. A transmission line (about 11 miles) long, will also be erected to Fairmont.

PONCA CITY, OKLA.—The 101 Ranch Company plans to rebuild its power house, recently destroyed by fire. The loss is estimated at $50,000.

RED ROCK, OKLA. — A transmission line will be erected to Ponca City, to secure electricity to operate the proposed local municipal plant.

BASTROP, TEX.—The Texas Power & Light Company, Dallas, contemplates the erection of a power station here to supply electricity to plants operating in the lignite fields.

REFUGIO, TEX.—Plans are being prepared by the Refugio Glass Company, National Bank of Commerce Building, San Antonio, for the erection of a new plant on property recently acquired at Refugio for the manufacture of glass bottles and other glass containers, to cost about $75,000. The plans include a power plant.

WACO, TEX.—The Texas Power & Light Company has issued $2,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

## Pacific and Mountain States

SEATTLE, WASH. — The Washington Iron Works, Seattle Boulevard, will build a power plant, 50 ft. x 110 ft., in connection with plant additions, to cost about $500,000. Jerald Fink is president.

SPOKANE, WASH. — The Washington Water Power Company has been granted permission by the Federal Power Commission to construct a hydro-electric plant at Kettle Falls, Columbia River, to develop 153,000 hp. The company has recently acquired the property of the Intermountain Power Company.

FORT KLAMATH, ORE. — The Fort Klamath Meadows Company has been granted permission by the Federal Power Commission to construct a hydro-electric plant on Anna Creek, National Park.

FRESNO, CAL.—The San Joaquin Light & Power Corporation will build an addition to its substation at California and Orange Avenues, to cost $102,000. The output will be increased from 10,000 hp. to 17,000 hp.

OAKLAND, CAL.—Plans are being prepared by the Council for the installation of an ornamental lighting system around Lake Merritt, comprising 560 lamp standards.

OROVILLE, CAL. — City Trustees are negotiating with the Pacific Gas & Electric Company for the purchase of its electric distributing system, to be operated by the municipality.

SAN FRANCISCO, CAL.—Bids will be received by the Board of Public Works, until Aug. 9 for electrical equipment for the Mocassin Creek power plant of the Hetch-Hetchy water project, including transformers and accessories, to cost about $75,000, and switchboards, etc., cost $60,000.

SAN LEANDRO, CAL.—The Pacific Gas & Electric Company has completed surveys for a transmission line from Centerville to Ferry Lane, near San Leandro.

WILLITS, CAL.—The Central Mendocino County Power Company applied to the State Railroad Commission for permission to issue $200,000 in capital stock, the proceeds to be used for the construction of an electric plant and system.

PALISADES, COL.—The plant and holdings of the Palisades Service Company has been purchased by the Grand Junction (Col.) Electric, Gas & Manufacturing Company.

## Canada

VANCOUVER, B. C.—The Pacific Mills, Ltd., 510 Hastings Street, West, is considering the construction of a hydro-electric plant at Ocean Falls, to cost between $450,000 and $500,000.

VANCOUVER, B. C.—The British Columbia Gas & Electric Company contemplates the construction of a hydro-electric plant of 25,000 kw. capacity, to cost about $1,000,000.

VANCOUVER, B. C.—The British Columbia Electric Railway Company has started work on the construction of a new 640-ft. dam and the rebuilding of the present dam at Stave Lake, providing for the installation of a fourth power unit, to cost about $1,250,000. The company is also extending its Broadway West line in the city, to cost $75,000.

CORNWALL, ONT. — The counties of Stormont, Dundas and Glengarry have granted a franchise to W. W. Beach, Iroquois, to erect electric transmission lines on the highways in the three counties.

GUELPH, ONT.—Improvements contemplated by the Hydro-Electric Power Commission of Ontario on the radial system calls for an expenditure of about $116,379.

LINDSAY, ONT. — The Hydro-Electric Power Commission of Ontario contemplates rebuilding its system in Lindsay, in the district south of Kent Street, this season.

PETROLIA, ONT. — The Peninsular Sugar Company, Ltd., is planning to build a sugar factory in Petrolia, to cost about $800,000. The plant will be equipped throughout with electrically driven machinery.

SAULT STE. MARIE, ONT.—The Hydro-Electric Power Commission of Ontario will make a survey of the power still available in the rapids and prepare estimates of the cost of developing it.

## Electrical Patents

**Announced by U. S. Patent Office**

(Issued June 27, 1922)

1,421,246. APPARATUS FOR REGULATING THE VOLTAGES OF DYNAMO ELECTRIC MACHINES; A. J. Jullin, St. Cloud, France. App. filed May 20, 1920. Type used for lighting vehicles.

1,421,250. CONDUIT PLOW; W. H. Kempton, Wilkinsburg, Pa. App. filed Nov. 26, 1920. Third rail contact for railways.

1,421,261. CONTROL SYSTEM; E. S. Lammers, Jr. App. filed May 7, 1919. Control of field excitation of generators.

1,421,269. ELECTROMAGNET; S. M. Lucas, Pittsburgh, Pa. App. filed Dec. 16, 1920. With neutral and polarized armatures.

1,421,272. RELAY; P. MacGahan, Pittsburgh, Pa. App. filed Dec. 14, 1916. Means for protecting the contacts.

1,421,276. ELECTRIC LAMP; E. G. Mascarenhas, Juiz de Fora, Brazil. App. filed Sept. 5, 1919. Fith two filaments.

1,421,344. AUDIBILITY METER; E. Garretson, Buffalo, N. Y. App. filed May 8, 1919. Measures strength of incoming radio signals.

1,421,350. HAIR-CUTTING MACHINE; E. B. Powell, Newark, N. J. App. filed Aug. 14, 1920. Clipper with self-contained driving mechanism.

1,421,355. CONNECTOR FOR STORAGE BATTERIES; H. E. Walker, Chicago, Ill. App. filed Oct. 27, 1920. Clamp arrangement.

(Issued July 4, 1922)

1,421,399. BATTERY HAND PAMP; C. F. Burgess, Madison, Wis. App. filed May 14, 1920. Removable reflector for dispersing light.

1,421,403. SWITCHBOARD SIGNAL; G. Carlson, Rochester, N. Y. App. filed Aug. 22, 1919. Telephone clearing-out signal.

1,421,435. ELECTRIC APPARATUS FOR PROPELLING PROJECTILES; A. L. O. Fauchon-Villeplee, Paris, France. App. filed Apr. 1, 1919. Direct current flowing through projectile subjected to magnetic field.

1,421,481. COMBINATION TROLLEY WIRE STRETCHER AND SPLICE; D. R. Hunley, Cofoco, W. Va. App. filed Aug. 22, 1921.

1,421,500. AXLE RECORDING DEVICE FOR RAILWAYS; W. Kolbe and J. Fritzen, Essen-on-the-Ruhr, Germany. App. filed Feb. 14, 1921. Records weight, time and number of trains passing.

1,421,516. MAGNETIC HEALING APPARATUS; S. Maeshima, Tokyo, Japan. App. filed May 2, 1918. Therapeutic device to stimulate nerves and cells.

1,421,528. FLASH LIGHT; L. A. Miller, New Haven, Conn. App. filed July 14, 1921. Internal latch for cover.

1,421,538. DIRECT CURRENT TRANSFORMER; A. F. Nesbit, Wilkinsburg, Pa. App. filed Mar. 9, 1921. Three phase rotary converter.

1,421,549. LIGHTING SYSTEM FOR AUTOMOBILES; W. F. Penrod, Blanchester, O. App. filed Aug. 15, 1917. Lamps supplied from magneto.

1,421,561. BATTERY CANDLE; E. Pugsley, New Haven, Conn. App. filed Nov. 3, 1921. Small flashlight in form of candle.

1,421,584. RESILIENT WHEEL; H. R. Shafer, Detroit, Mich. App. filed Jan. 19, 1921. Springs between the rim and hub.

1,421,586-1,421,589. STAND AND AUTOMATIC SWITCH FOR ELECTRIC IRONS; A. J. Shirk and S. Cohen, New York, N. Y. App. filed Jan. 28, 1920. Four patents describing iron of the type that is heated when on stand.

1,421,634. ELECTRIC MOTOR; C. L. Weltner, Looneyville, W. Va. App. filed June 21, 1921. Two wheels propelled by magnets on rims.

1,421,702. TESTING APPARATUS; R. G. McCurdy, Cresskill, N J. App. filed Aug. 19, 1920. For locating unbalance in transmission lines.

1,421,717. PAN WITH OVERFLOW ALARM DEVICE; A. Renda, New York, N. Y. App. filed Feb. 23, 1921. Operated by float.

1,421,720. METHOD OF AND APPARATUS FOR DETECTING THE PRESENCE OF ONE GAS IN ANOTHER; C. H. M. Roberts, Washington, D. C. App. filed June 3, 1920. Depends on mobility of the ions in gases.

1,421,734. COMMUTATOR; William Sparks, Jackson, Mich. App. filed July 16, 1920. Disk commutator for small motors.

1,421,756. MASSAGE APPARATUS; Charles Arnao, Brooklyn, N. Y. App. filed Nov. 4, 1921. Hood for steaming face.

1,421,828. POWER TRANSMISSION AND ELECTRIC BREAKING; F. H. Pritchard, Schenectady, N. Y. App. filed Sept. 11, 1920. Applies to railway motors.

1,421,850. STAND AND AUTOMATIC SWITCH FOR ELECTRIC IRONS; A. J. Shirk and S. Cohen, New York, N. Y. App. filed Dec. 16, 1919. Iron heated only when on stand.

1,421,853. PULL SOCKET SWITCH; R. D. Smith, Boston, Mass. App. filed Oct. 27, 1916.

1,421,864. TELEPHONY; H. S. Turner, Washington, D. C. App. filed Aug. 12, 1915. Busy line tests for semi-automatic exchange.

1,421,894. POWER TRANSMISSION AND ELECTRIC BRAKING; A. F. Batchelder, Schenectady, N. Y. App. filed Sept. 11, 1920. For railway operation.

1,421,899. TRANSFORMER; R. V. Bingay, Pittsburgh, Pa. App. filed Oct. 17, 1919. Oval shape coils.

1,421,931. ELECTRIC BRAKING; P. W. Forsberg, Schenectady, N. Y. App. filed Feb. 21, 1920. Resistance breaking for electric locomotives.

1,421,937. ELECTRIC WATER HEATER; A. M. Goldberg, Indianapolis, Ind. App. filed July 28, 1921. Transformer primary coil surrounded by shorted secondary in form of pipes.

1,421,939. AIR HEATER; M. Hachalachi, New York, N. Y. App. filed Oct. 11, 1918. Heated by gas, oil, electricity or steam.

1,421,998. COMMUTATOR AND BATTERY CHARGING OUTFIT INCLUDING THE SAME; D. S. Scarborough, St. Louis, Mo. App. filed Apr. 11, 1919. Rectifier and storage battery set.

1,422,013. THERMIONIC APPARATUS APPLICABLE FOR WIRELESS TELEGRAPHY AND OTHER PURPOSES; L. B. Turner, Cambridge, England. App. filed Feb. 6, 1920. Regenerative control circuit.

1,422,026. PROCESS AND APPARATUS FOR ELECTROSTATIC SEPARATION OF FINELY DIVIDED DISCRETE MATERIAL; G. R. Brown, Bondi, New South Wales. App. filed Jan. 7, 1920.

1,422,027. AUTOMATIC ELECTRIC GENERATING UNIT; W. W. Bucher, Chicago, Ill. App. filed Mar. 20, 1919. Engine-generator set.